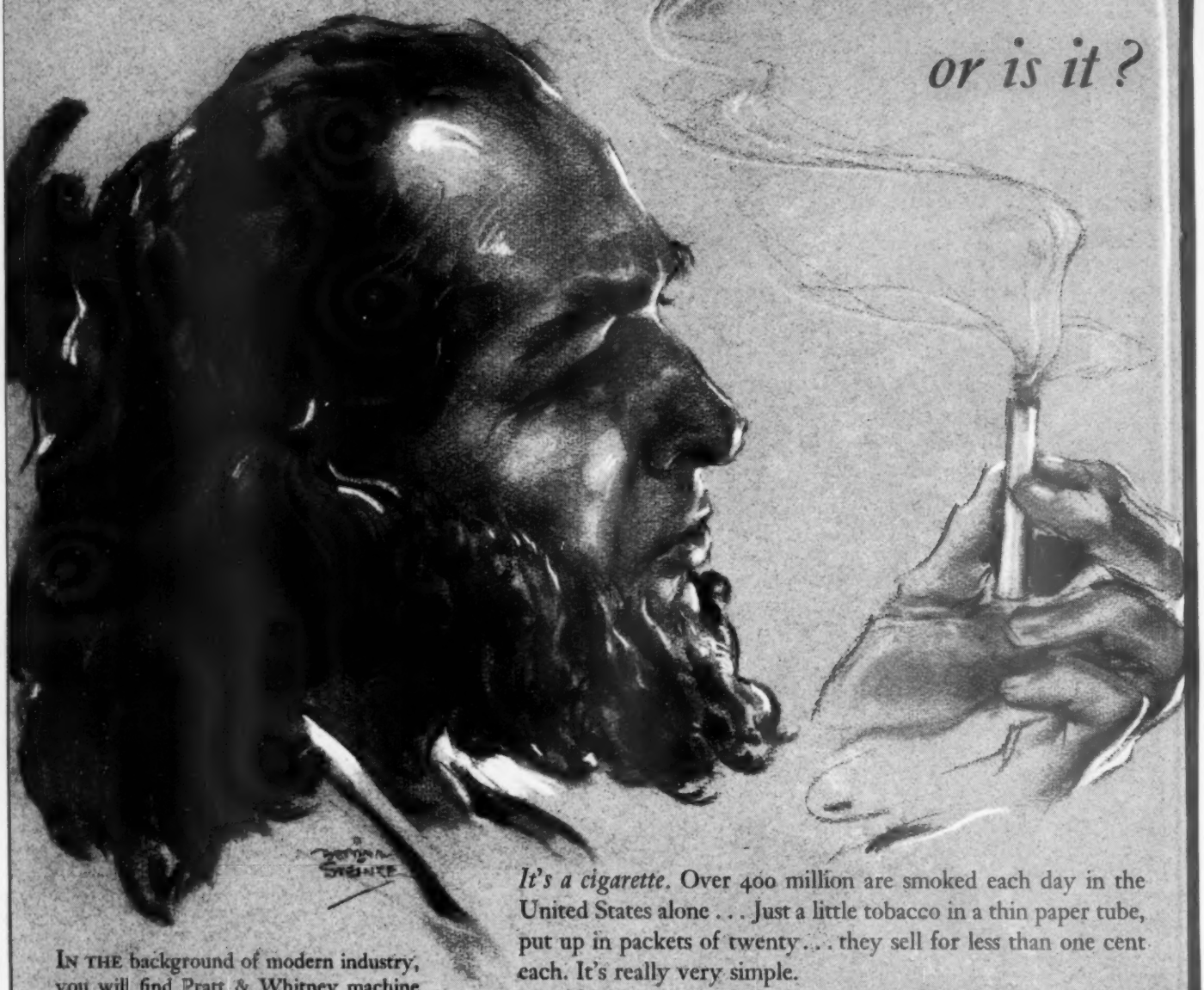
AUGUST, 1940

The TOOL ENGINEER

Official Publication of the
AMERICAN SOCIETY OF TOOL ENGINEERS

Simple, isn't it, Mr. Aristotle . . . .

or is it?



IN THE background of modern industry, you will find Pratt & Whitney machine tools, small tools and gages. Through accuracy, Pratt & Whitney keyword since 1860, production costs are lowered...new products are developed...new industries arise . . . new jobs are created. Pratt & Whitney accuracy makes rare luxuries common. Man moves to ever-improving comfort, economy, convenience, health, safety...across the background of Pratt & Whitney accuracy.

It's a cigarette. Over 400 million are smoked each day in the United States alone . . . Just a little tobacco in a thin paper tube, put up in packets of twenty . . . they sell for less than one cent each. It's really very simple.

No, of course slaves couldn't make them fast enough. Cigarettes are made and packed by *machinery* . . . Machines shred and blend the tobacco, make and print the paper, roll and trim the cigarettes, print and assemble the wrappers, pack, seal and stamp the packages, and put them in cartons . . .

What makes these machines? Other machines such as jig borers, lathes, drills, millers, die sinkers, shapers, grinders . . . yes, their work has to be accurate . . . measured in tenths of thousandths. You're quite right, sir, it couldn't be done by hand. We are so accustomed to seeing these everyday luxuries we forget that without their machine backgrounds they would be utterly impossible.

Accuracy

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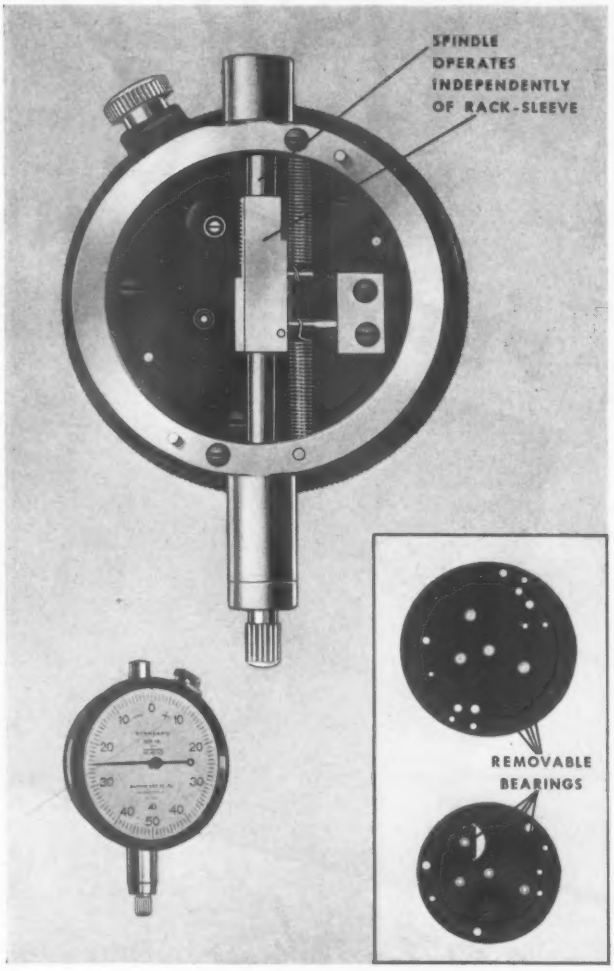

shock-proof!

SUSTAINED higher accuracy and longer life are provided by "Standard" dial indicators equipped with shock-proof mechanism—kept dust-and moisture-proof within the indicator body itself.

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Individual replaceable bearings for spindle (hardened steel, ground and lapped) and for the special involute-toothed pinions and gears, further cut maintenance cost.

Address: Standard Gage Company, Inc., 80 Parker Ave., Poughkeepsie, N. Y.

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THE TOOL ENGINEER

Official Publication of the American Society of Tool Engineers

CONTENTS OF VOLUME IX NUMBER 4

August, 1940

ARTICLES

EDITORIAL

FEATURES

NEWS

ROY T. BRAMSON
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Associate Editor

Published by
THE BRAMSON PUBLISHING CO.
2842 W. Grand Boulevard
DETROIT, MICHIGAN
MAdison 7553

BRANCH ADVERTISING OFFICES

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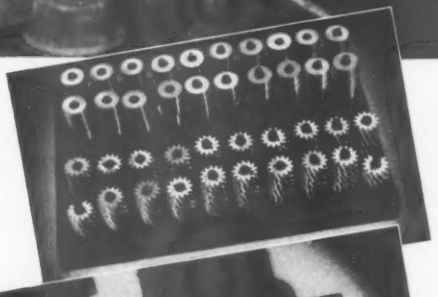
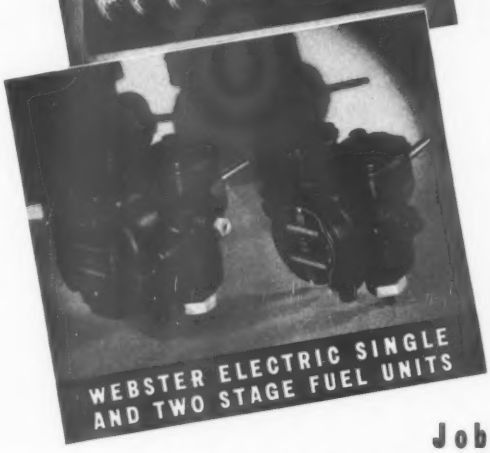
Application blanks and information pertaining to membership in the American Society of Tool Engineers may be had by addressing The Tool Engineer, 2842 W. Grand Boulevard, Detroit, Michigan, or the Secretary's office, 2567 W. Grand Blvd., Detroit, Michigan. Dues are $5 initiation fee, $6 per year for senior grade membership and $3 per year for junior grade membership. Junior membership initiation fee $2.

DO YOUR GEARS REQUIRE THIS ACCURACY?





WEBSTER ELECTRIC SINGLE AND TWO STAGE FUEL UNITS

Hobbed Gears in Webster Electric Fuel Units Held to ±.0002 Kickout with Extra Fine Finish . . . .

This accuracy and finish is of vital importance for smooth and quiet running fuel units used on oil burners. The gears are hobbed on six Barber-Colman No. 3 Hobbing Machines in one operation and over 700 gears are produced in 9 hours. Most of the time the machines are run two and three shifts per day.

To get this high accuracy, the machines are equipped with taper hob spindles and only Barber-Colman ground Class AA hobs with taper bores are used. Each hob produces approximately 1400 gears per sharpening and a total of 18,720 gears during its entire life.

In addition scrap loss has been reduced to "less than one-tenth of 1%."

If accuracy and finish are your problems, we suggest you ask a Barber-Colman field engineer to call. There is no obligation and he will welcome an opportunity to work with you.

Job Data in Brief

Name of Part — Suction and pressure gears for rotary pumps in Webster Electric Fuel Units.

Material — No. 2 stressproof steel; 269 Brinell hardness.

Operation — Hobbing precision involute gears 0.8125" in diameter; 4 widths, ½" to ⅜" wide; 13 teeth.

Hobbing Machines — Six Barber-Colman No. 3 Hobbing Machines, run by two operators.

Hob — Barber-Colman Ground Hobs, Class AA, 1⅞" diameter and length; 0.626" taper bore; 20 pitch; 12 gashes.

Holding — On arbor between centers; 4 gear blanks per load, with washer at each end which eliminates burr.

Feed — 0.010" per rev. of work.

Speed — 270 r.p.m. hob speed.

Accuracy — ± 0.0002" kickout; pitch diameter not to exceed 0.0003" runout; extra fine finish with good bearing to full depth of teeth.

Production — 700 gears in 9 hours.

Pieces per Setting — 288.

Pieces per Grind — 1440.

Hob Life — 13 sharpenings; or 18,720 gears.

Remarks — Fuel unit pump gears must mesh perfectly and run practically noiseless. Despite exacting inspections and running tests, scrap loss was reduced to "less than one-tenth of 1%.

Write for bulletin No. 8124 covering the Barber-Colman No. 3 Hobbing Machine which handles work up to 5" dia. by 7" face, and 12 diametral pitch or finer. If your work is larger, advise us and we will send bulletins covering Barber-Colman machines that will handle it.

BARBER B-C COLMAN

PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

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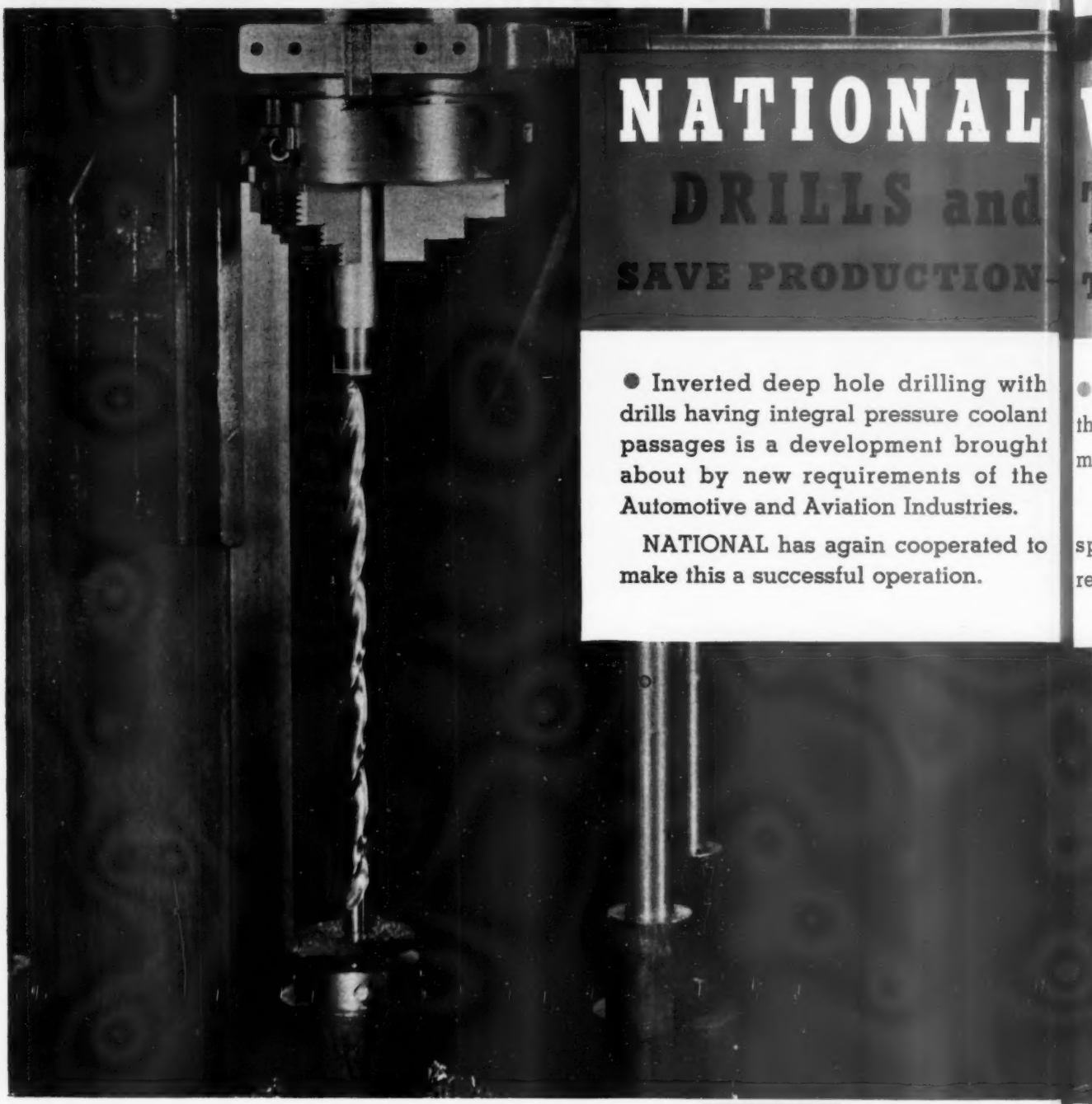

● Inverted deep hole drilling with drills having integral pressure coolant passages is a development brought about by new requirements of the Automotive and Aviation Industries.

NATIONAL has again cooperated to make this a successful operation.

NATIONAL

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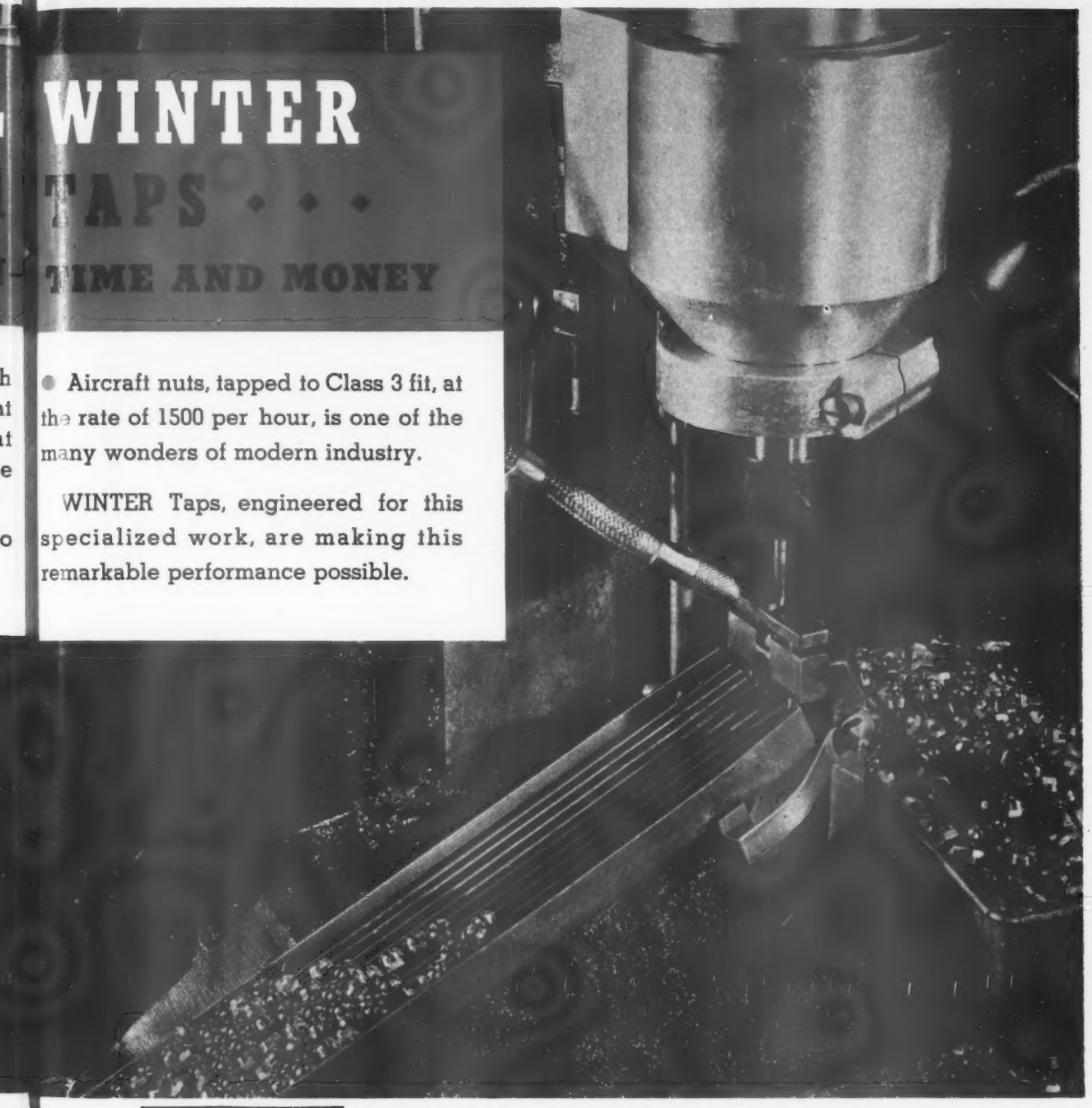

WINTER TAPS • • • TIME AND MONEY

● Aircraft nuts, tapped to Class 3 fit, at the rate of 1500 per hour, is one of the many wonders of modern industry.

WINTER Taps, engineered for this specialized work, are making this remarkable performance possible.

WINTER

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Tap and Die Division of National Twist Drill & Tool Co., Wrentham, Massachusetts

8 SUGGESTIONS for HARDENING TOOL STEEL

THE following suggestions have been thoroughly tried and proved. They are offered as a basis for obtaining the best possible results in hardening tool steel:

1. All grades of tool steel should be heated slowly and uniformly. Preheating in a separate furnace or chamber prior to charging into the hardening furnace is advisable, especially if the hardening temperature is 1800 deg. F. or over. This practice reduces scaling and decarburization.

2. After the tool has been transferred to the hardening furnace it should be brought rapidly to proper hardening temperature and quenched. Overheating, or holding the steel too long at quenching temperature, results in grain growth.

3. Small or intricately shaped tools should be hardened in the lower part of the hardening range; larger tools in the higher part of the range. Always use the lowest hardening temperature that will effectively harden the piece.

4. The use of salt or lead baths reduces the required heating time by approximately one half. The tool, however, should be warmed prior to immersing in such mediums.

5. Brine is a more reliable and effective quenching medium than water because it reduces the effect of steam bubbles on the quenched part.

6. When hardening differentially, avoid a sharp line of demarcation between hard and soft sections. Arrange the quenching apparatus so that a uniformly strong flow of quenching medium washes over the sections to be more deeply hardened.

7. To avoid surface deterioration during hardening, pack the tool in a container with cast iron chips, sand or partially spent carburizing material.

8. After a tool has been removed from the quenching medium, begin the tempering operation immediately to relieve cooling stresses.

Bethlehem furnishes tool steel to fit every type of metal working job. Carbon and Carbon Vanadium . . . High Speed Cutting and Finishing . . . Hot Work . . . Die and Non-Deforming . . . Shock Resisting . . . and Special Tool Steels. A Bethlehem engineer will be glad to help you choose the grade best suited to your needs. To call on him involves no obligation.

BETHLEHEM STEEL

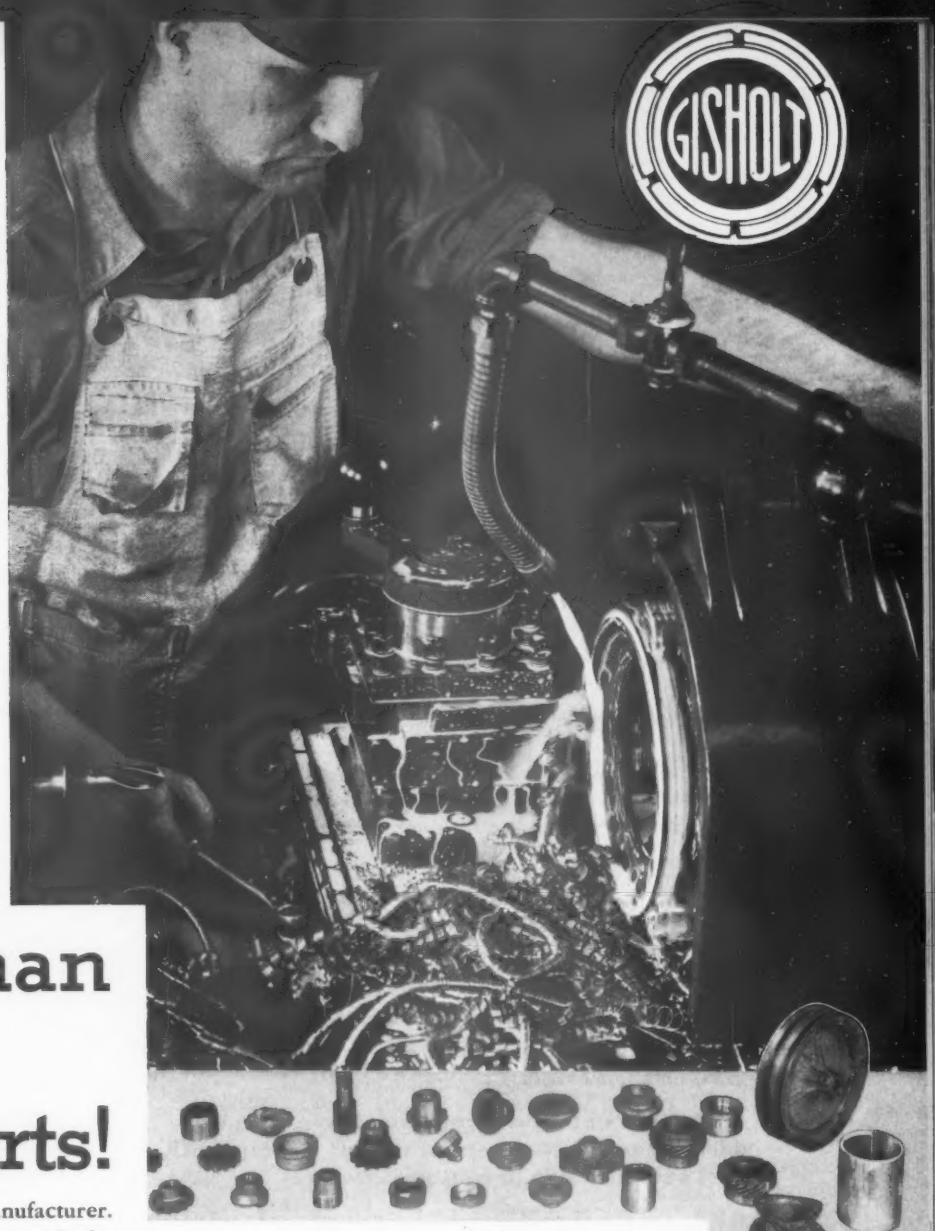
BETHLEHEM STEEL COMPANY

22% Saved

on more than 30 different parts!

PROFIT by the experience of this manufacturer. This new Gisholt No. 4 Ram Type Turret Lathe handles dozens of jobs for him—and it's extremely versatile, easier to operate, and enough faster to save an average of 22% on all these thirty-odd parts. That's a sizable saving on small runs. On larger quantities, savings as high as 60% are not unusual.

If you handle work of this kind on older machines, it's time to investigate the cost-cutting opportunities available to you through these new Gisholts. Any Gisholt engineer will gladly explain them—without obligation.



● *All parts shown here are machined on this Gisholt. Equipped with bar feed, collet chuck and 3-jaw chuck, this machine is suited to a wide variety of work, while Gisholt standard tools and tool holders make set-ups quick and easy. Full details on request.*

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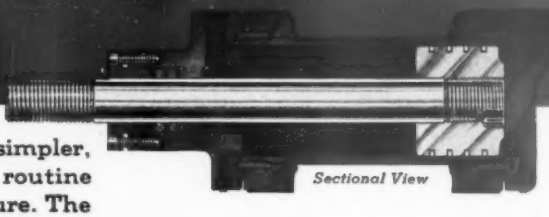
PRECISION CYLINDER CONSTRUCTION
that gets the most out of hydraulic power



Sectional View

Hannifin hydraulic cylinders are stronger, simpler, easier to apply—and all are subjected to routine fluid slip tests at 1000 lbs. per sq. in. pressure. The achievement of minimum fluid slip, with the resulting high efficiency performance in service, is based on the Hannifin patented design and precision manufacture.

Examine These Features:

NO TIE RODS: This simple, strong design eliminates a source of leakage and allows removal of end caps without collapse of other parts.

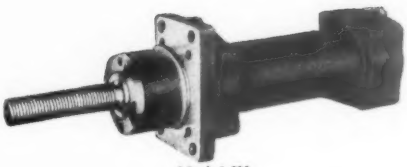
HONED BORE: Special mirror finish honing (no matter how large the bore) produces a straight, round, perfectly smooth cylinder. High efficiency piston seal means maximum power, minimum fluid slip.

UNIVERSAL CAPS: End caps may be positioned independently, with inlet port at top, bottom, or either side.

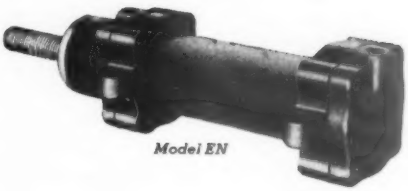
AIR VENTS: End caps have air vents on three sides. There is always an air vent at the top, with inlet at either side or bottom.

ALL TYPES AND SIZES: Seven standard mountings, with small diameter piston rod, 2 to 1 differential piston rod, or double end piston rod, with or without cushion. All sizes, for working pressures up to 1,000 and 1,500 lbs. per sq. in. Other types built to order, any size, for any pressure. Write for new Bulletin 35-H with complete specifications.

Model CN



Model JN



Model EN

Model HN

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HANNIFIN
HYDRAULIC CYLINDERS

The Tool Engineer

Shadow and Substance

An Editorial

By A. E. RYLANDER

WHILE many successful leaders in the industrial world are college men without practical training, it can be said that the majority are practical men with theoretical training. The same can be said for the field of Tool Engineering, where the leaders came up "the hard way", first learning their trade, then supplementing their practical knowledge with theory. While this condition may change, so that our future Tool Engineers be college alumni, it is almost a foregone conclusion that the curriculae of our technical schools will include practical training. We'll have the same conditions, with the sequences of training reversed.

For the present, however, the practical man is in demand, especially at a time when manual skill is at a premium, if not to man the machines and the tools, then to direct. And while, in the final analysis, the college man may go farther in his field, he will be in a successful minority whereas, proportionately, the practical man will be among a successful majority. Which means that, out of a thousand industrial leaders, or outstanding Tool Engineers, the greater proportion will have come up from the ranks. An offhand mental review, on the part of the reader, will substantiate this premise.

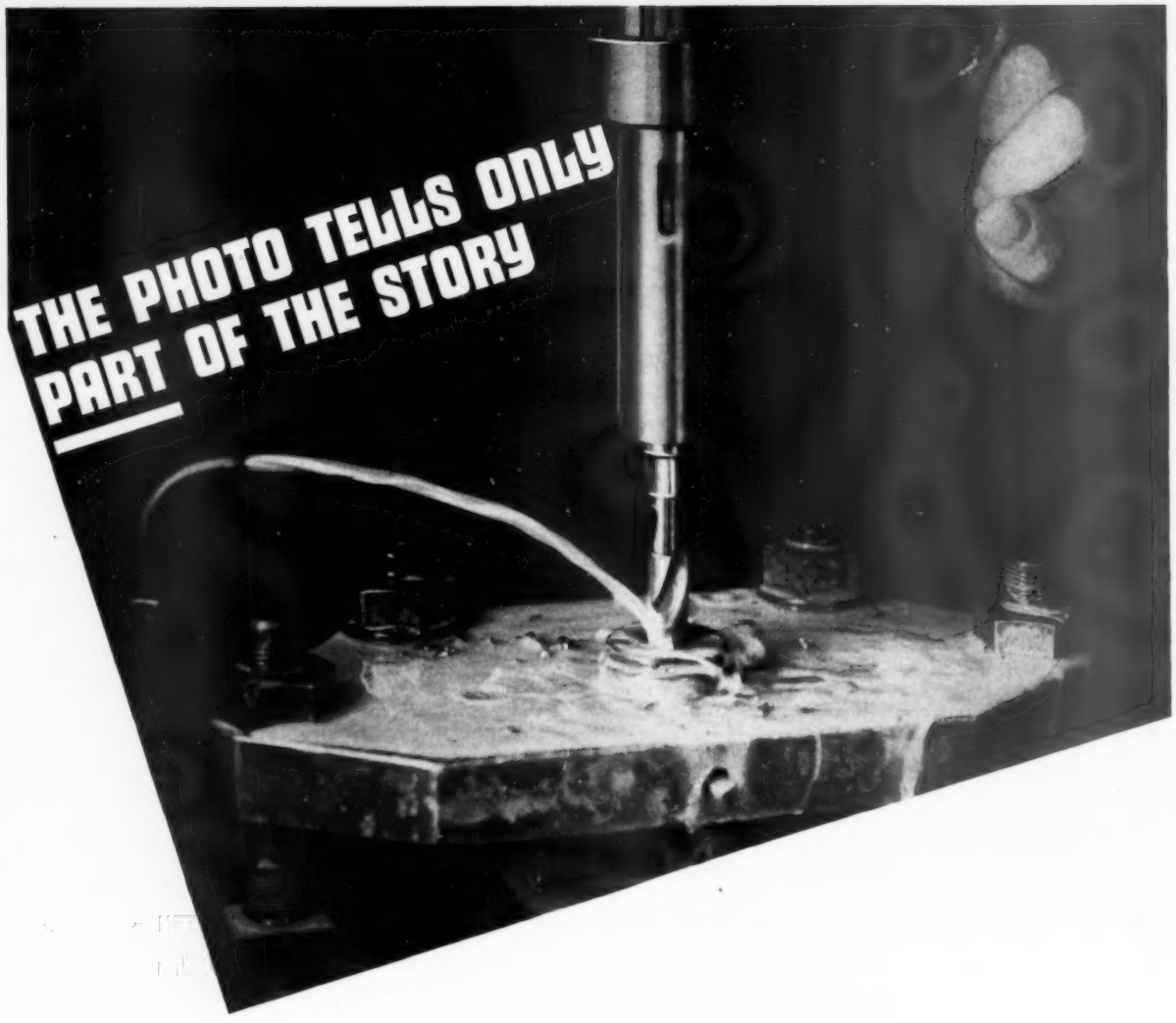
Now, it is not the writer's intent to stir up debate regarding the relative merits of college trained and practical men; this writing has other objectives, as will be disclosed. Consider that, barely a generation ago, there was launched an industry which, in its ramifications, revolutionized social customs, shortened time and distance, initiated mass production on a scale heretofore undreamed of, and produced more successful men than have ever been produced in any field in any age during the history of man. Obviously, we mean the automotive industry. The significant thing, however, is that this field was so revolutionary that there was no theoretical precedence; in its infancy, the automobile evolved by "cut and try" in which practical men were the evolutionists. (And what giants these men turned out to be!) But before them were their fathers, practical men too, hard headed farmers, skilled craftsmen, the horny handed type of pioneers who, doggedly persevering, had made America the Mecca of millions of foreign born who saw, in this land, opportunities that Europe, with its landed aristocracy, could not give them. Europe's aristocracy largely entailed from the heroes(?) of the battlefield, has its roots in destruction, while America's is rooted in the soil and the factory. And who shall say that the escutcheon of the American "self made man", with its device of construction, is not as bright as the aegis of the scion of a long defunct military leader?

Well, to a practical conclusion, having painted a verbal backdrop. As this is written, France's part in the shortest major war on record is history; the "finest army in the world" was vanquished in less than a month of fighting. Is it, now, just a coincidence that the democracies are so devitiated that they cannot stand before the virile force of the *blitzkriegers?* Or is it that, in our quest for a universal Utopia, we have grasped at the shadow and lost the substance? There are, of course, examples that refute the question, but these are for the moment demoted from the headlines and stand in the wings awaiting their cue for a later entry. In the meanwhile, they are tightening their belts in anticipation of possible strictures.

Would it not be well if America, figuratively speaking, also tightened its belt? On the face of things, we have had too much "education" of the wrong kind, and now is the time to quicken our brains and our will to work. It is time that we start training our young men to do useful things with their hands, as recently recommended by an industrial leader who now heads the nation's Defense Program. It is time that we stop educating our youth along lines for the moment submerged by graver issues, time that we stop being under-educated while we are being overcharged for what we get. Our annual bill for education is out of all proportion to values received in practical results. And, a nation that works with its hands can never go soft.

The American Society of Tool Engineers, through its annual and semi-annual meetings, is doing an excellent job in rousing the country from its apathy. Here has been born a vital force which, with its inventive genius and its practical realization, with its lively enthusiasm and conservative analysis, has become an inspiration in the industrial and economic life of America. And educators, recognizing this force, are changing their curriculae to meet the more practical demands of the times. We are on the way back to fundamentals, a process that will be accelerated once public sentiment demands the change.

By shedding our false sense of "white collar" superiority for work-shirt security and embracing the ideal of getting down to work—*yes, with the hands.* American youth can earn while it learns and mayhap go its fathers one better. What better opportunity to put this scheme to test than now, when national emergency stirs realization of neglected opportunities that the totalitarian governments have not overlooked. Our renaissance, in the present crisis, will be highly salutary if it makes us as hard, as simple, self reliant and strong in body and character as were our forebears who projected this land into empire. These spurned the shadow, but grasped the substance with able hands. The substance is still here.



● Action photography caught this stream of coolant right in "mid-stream," so to speak. It even "stopped" the drill which was churning in at a speed of over 500 R. P. M.

But the photo does *not* show the study that a G. T. D. Greenfield engineer put into this particular job. It does *not* show long discussions of jig design. It does *not* show a number of tests made to determine the best speed to drill the particular alloy steel used in the part for which this jig was designed. It does not and cannot show the cooperation which *"Greenfield"* sales engineers give to every *"Greenfield"* customer, large or small, to enable him to get only the best out of his *"Greenfield"* tools — to get more production at less cost than from any other tools he can buy anywhere. And because G. T. D. Greenfield is a large, experienced concern, *"Greenfield"* is able to furnish this type of service at no extra cost.

So, when you look at this photograph, remember that what it does *not* show is far more important than what the camera caught.

Greenfield Tap & Die Corporation • Greenfield, Mass.

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TAPS · DIES · GAGES · TWIST DRILLS · REAMERS · SCREW PLATES · PIPE TOOLS

Let's Go . . .

. . . to Cincinnati

TOOL ENGINEERS from mass production industries from all parts of the United States and Canada will travel toward Cincinnati on October 17th, 18th and 19th for what may be the most important meeting yet to be assembled of the Nation's key men in National defense.

Tool Engineers who are responsible for converting blueprints into production operations of the multitude of items ranging in extent from fuse caps to tractors, anti-aircraft guns, aircraft parts of all kinds, motor trucks, and a thousand and one other highly important items of defense, will be on hand on these important days to attend technical sessions, inspection trips and other important events scheduled for their entertainment and instruction in the Cincinnati area—major center of machine tool manufacturing.

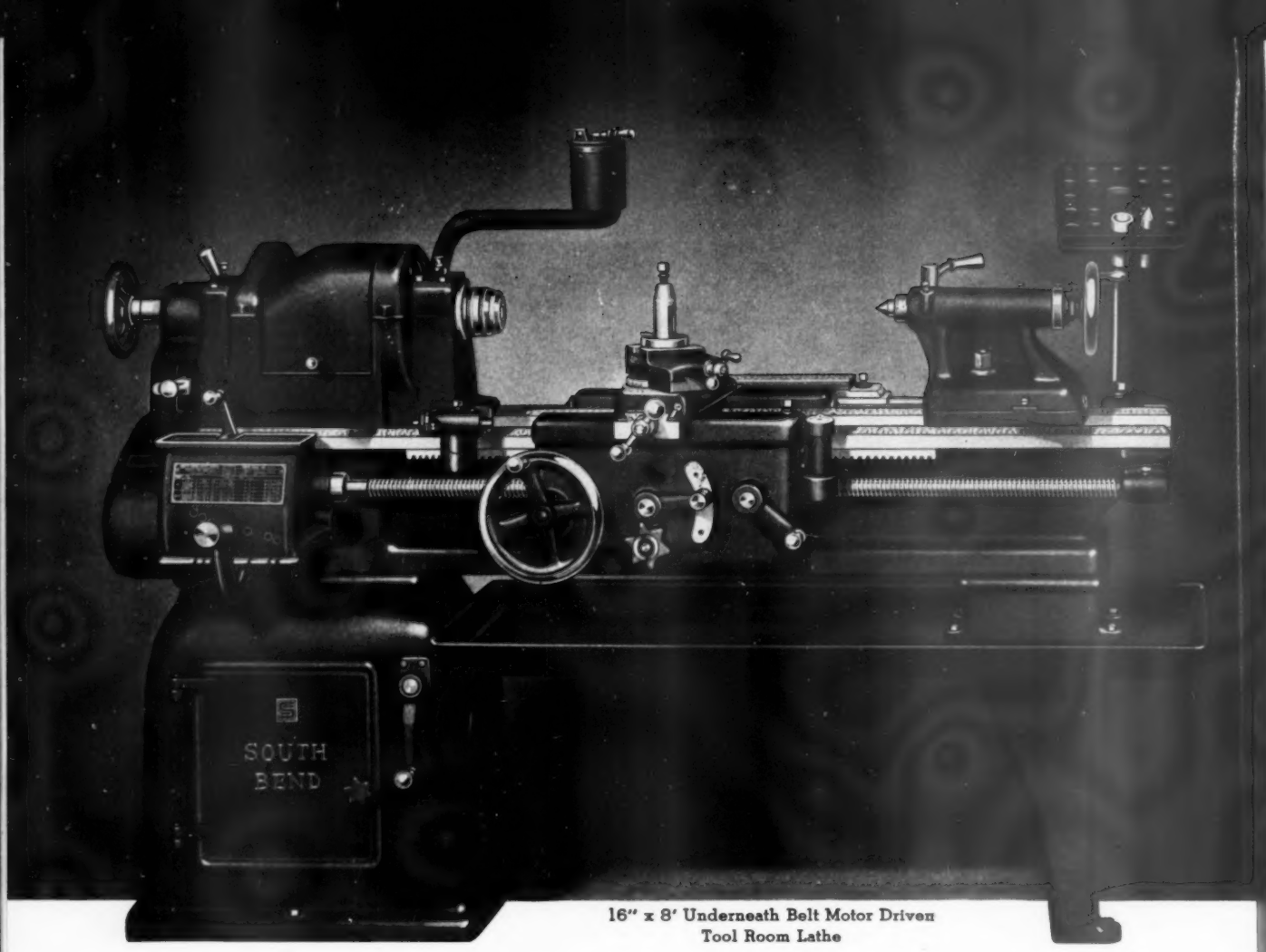
The sessions will include a symposium on the subject "Should Industry Assume the Burden of Special Education", with all viewpoints on the question being presented. The subject is regarded as of immediate vital importance due to the shortage of trained Tool Engineers and designers in industry. "Aeronautical Preparedness" will be the subject of the dinner meeting on the 18th of October, while technical programs will include a symposium on gear production methods.

Ford R. Lamb, National Executive Secretary of the American Society of Tool Engineers; W. J. Frederick, Chairman of the Cincinnati Chapter, which will be host to the important meeting; Tom Kling of the Lamson and Sessions Company; Charles Carr of the LeBlond Machine Company; and W. D. Averill, Cincinnati Milling Machine Company, are among the many committee members who have been arranging the important details of the three day meeting.

In addition to the many educational features on highly practical and interesting topics suited to the present time, Tool Engineers will be afforded in this Semi-Annual Meeting an opportunity to visit the Nation's important machine tool building plants, renew old acquaintances, and see and hear many of the Nation's most prominent notables in the world of mass production.

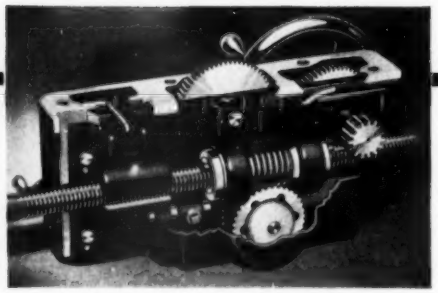
In addition, Cincinnati, one of the most interesting manufacturing or industrial areas in the United States, offers many opportunities for diversion. Cincinnati can be reached by railroad, steamship, plane and it is anticipated that an unusually large attendance will come to Cincinnati on October 17, 18 and 19. When the gavel is pounded for the opening session on Thursday morning at ten A. M. October 17th, we will be among those present—we wouldn't miss it for the world. Would you?

A.S.T.E. FALL MEETING, CINCINNATI, Oct. 17, 18, 19



16" x 8' Underneath Belt Motor Driven
Tool Room Lathe

SOUTH BEND LATHES FOR PRECISION WORK



Double Wall Apron

Back view of the Double Wall Apron showing the rigid, one-piece box type construction that provides a substantial support for both ends of the gear shafts.

Gears in the apron are of steel and have a reservoir and felt wick automatic oiling system. Worm drive assures smooth operation of feeds on all classes of work.

South Bend Lathes have been giving thousands of users dependable service on the most exacting classes of precision machine work for more than thirty years. Sound design, the most expert workmanship and the best materials available are combined in South Bend Lathes to give them permanent accuracy and efficiency.

SIZES AND TYPES

Manufactured in 9", 10", 13", 14½" and 16" swing, bed lengths 3' to 12', in Motor Drive and Countershaft Drive. Attachments are available for production, tool room and general machine work.

ON DISPLAY IN ALL PRINCIPAL CITIES

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LATHE BUILDERS SINCE 1906

923 E. Madison St., South Bend, Ind., U.S.A.

Jigs and Fixtures for

Machining Die Castings

RELATIVELY little machine work is needed, as a rule, on die castings because they are cast so close to the size required. For this, among other reasons, die castings are often more economical than sand castings. In addition, die castings, and especially those made in zinc alloy (which is used for about 75 per cent of all die castings), usually come from the die with surfaces so smooth that they do not require grinding or polishing except, in some cases, where the parting line of the die comes. Once the flash is removed, a light buffing is the only operation necessary on many die castings to prepare them for plating, so smooth are the surfaces produced by polished dies.

Some machining is required, of course, on many die castings, when dimensions closer than can be held in the casting itself are needed, but it is rarely necessary to remove much metal, the allowance for machining often being less than 1/32 in. It is common practice to core holes remarkably close to finished size, but there are cases, especially where cores would increase die cost unduly, when it is more economical to drill or to punch holes than to core them. Holes which are cored can usually be reamed to finished size and do not have to be drilled or bored, as a rule, as do holes in most sand castings. This not only saves the drilling operation but, when a jig is needed, one for reaming is all that is required, where, for sand castings, both drilling and reaming jigs often are needed. There are similar savings in tapping, since it is usually feasible to core the hole to tapping size. In some cases, the thread can be cast, although it is usually cheaper to tap than to cast threads except for some large diameters.

Zinc alloy die castings machine about the same as do soft brass parts and tools are usually ground as for use on such brass. Details as to the grinding of tools, cutting speeds and the like have been given in other articles which the present author has prepared, and need not be repeated here, as copies of such articles are available.

Tooling here described is mostly that used with die castings in zinc alloy, but most of the jigs and fixtures are suited for use also in aluminum and other die casting alloys and some of those illustrated are so used.

To those who are not familiar with die castings and especially with castings in zinc alloy, it may be a surprise to learn that many of the operations performed on these castings are done in punch and similar presses. This is partly because the zinc alloys in particular are highly resistant to impact at normal room temperatures and so can withstand any shock incident to punching, shaving, broaching and burnishing, without injury. Many of these operations could not be performed, of course, if die castings were brittle as is cast iron, for example, and some other cast metals. It is even possible in some cases to perform some forming operations on zinc alloy die castings. They can be sheared, spun, staked, riveted and sometimes formed if supported in about the same way that stampings would be for similar operations. In all such cases, however, the metal should not be at a temperature much below 70 deg. F. and, for forming, heating to a temperature as hot as the bare hand can stand is advisable.

By HERBERT CHASE

A novel presentation which shows a number of representative setups is on the following pages.

Die castings are produced, of course, in steel dies which are parted, usually, at right angles to the direction of the die motion, to permit of ejecting the casting when the die is opened. Supplementary partings for slides and cores are often required also and it is usual to leave sufficient clearance openings at main parting lines so that air in the die cavities will be expelled as the molten metal is forced in. This clearance results in flash at the partings and where there is a working clearance between parts having motion relative to the main die blocks. Flash occurs at the ends of holes cored through the casting and usually has to be removed by drilling, punching or some similar operation. If through holes be required in thin sections, it is often cheaper to punch them than to core them, as a punch, or some equivalent has to be used in any case to clear the flash and it is a simple matter to punch a hole especially in zinc alloy castings, where the section is $\frac{1}{8}$ in. or less in thickness. To do so may save considerable die expense, especially if the core must be at an odd angle. Deeper holes are usually cored unless, again, they come at an odd angle, in which case it is sometimes, but not always, cheaper to drill them. In general, flash which comes at contours and in accessible holes is sheared by forcing the casting through a shaving die and by using punches or both. For large castings or most rapid work, a punch press is often used, but many hand operated arbor presses and some kick presses also are employed.

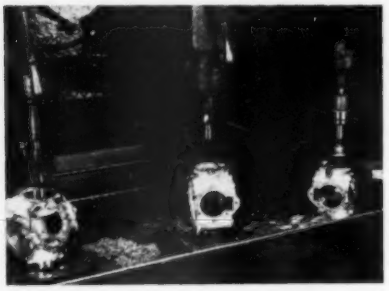
Most die casting shops do chiefly job work and, for economy, usually must confine their equipment for machining castings to simple, general-purpose machines adapted to a fairly wide range of work. These machines are nearly always light and fairly high speed types because little metal need be removed. The machines most often used are punch, arbor and kick presses, drill presses, light lathes, sanding machines, grinding wheels and buffing heads. Saws for gate removal are often employed.

Not infrequently, as some accompanying illustrations show, it proves more economical to build a simple bench fixture, which may perform several operations in a single setup, than to do the work on standard tools. Sometimes these fixtures include, however, one or more motor-driven drilling heads which may be arranged to do several operations simultaneously. Naturally, the larger the quantity of castings required, the more it may be feasible to spend for special tooling to effect small savings in handling or in doing work more rapidly.

Only a relatively few years ago, die casters commonly had long rows of benches at which much hand filing was done, chiefly in removing fins. Today, one finds relatively little hand filing and that chiefly on short-run jobs in which the cost of special tooling is not justified. The modern die casting shop has thus become more efficient. It takes advantage of faster processing, but in so doing takes care not to tie up in special tooling more capital than is justified by the quantity and character of work it is called upon to do.

The following illustrations show a fairly representative group of setups, although some are rather unusual because of special requirements. It is hoped and believed that some of the setups illustrated will suggest economies in future machine work on die castings.

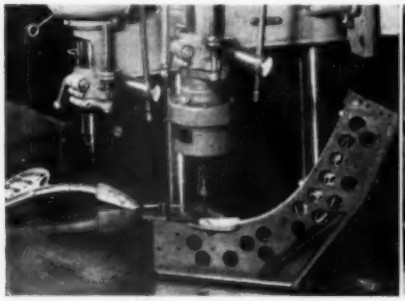
JIGS AND FIXTURES FOR MACHINING DIE CASTINGS



A UNIQUE TOOL is employed in this three-spindle drill press setup, and with remarkable results. The die casting is a gasoline pump body having four cylinders, two in one common axis and two in another at right angles to the first. In the operations shown, the cylinders are reamed. Fixtures used are simple clamping types with locating pins set to insure that castings are centered under the reamers and are securely held. Cylinder holes are cored about 0.025 in. undersize and the first reaming operation is done with inserted-blade carbide tipped reamers which run straight through the two sets of cylinders. These enlarge the hole by 0.010 in., leaving about 0.0075 in. on a side to be removed in the final cut which is made by the unique reamer carried by the spindle at right.

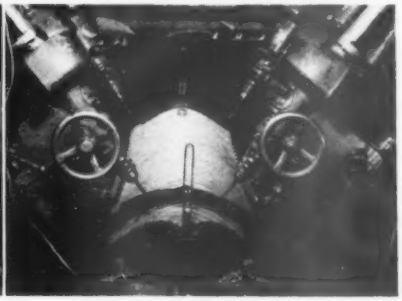
Cutting with this tool is done by a hardened steel disk which is free to turn about an axis tilted a few degrees from the vertical. The cutter is carried on a vertical arbor which, in turn, is mounted on the third press spindle and rotates with it. There is, however, between the cutter disk and the arbor a ball bearing and as the arbor rotates, the disk, because of its inclined mounting, is given a gyrating motion. Although the disk is free to rotate, it does not do so, but affects the cut by reason of its gyration as it is fed down ward with its rotating arbor. In so doing, it enlarges the hole by 0.015 in. and produces a remarkably smooth and mirror-like surface on which practically no tool marks can be seen.

Even though this unique tool removes more metal than the two inserted blade reamers do, it leaves a far smoother cut. Moreover it finishes two pairs of cylinder bores while the other reamers finish one pair each. It has produced many thousands of holes without requiring sharpening and still cuts with the desired accuracy and with a smoothness comparable to burnishing.

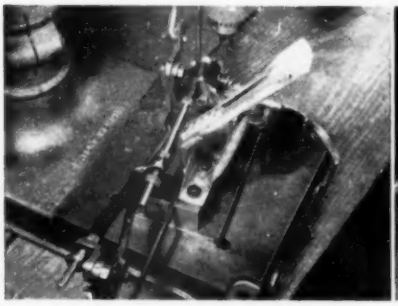


A BOX JIG is being used here for drilling and tapping holes for fastening screws. The jig has a face normal to each hole required and each face is fitted with hardened bearing pins. The jig is rocked into each successive position for drilling and tapping and 200 pieces an hour are handled. The holes might have been cored but only at greatly increased cost.

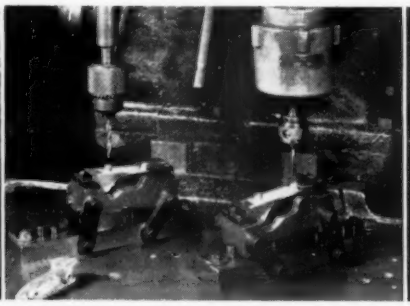
STEERING WHEEL HUBS are often die cast and, as the wire spokes to be inserted are radial, and hence come at different angles, the holes are not usually cored. This special setup uses three heads each with five spindles controlled by a common lever at the operator's right. It drills fifteen holes simultaneously in the hub which is held in the central fixture.



AUTOMOBILE RADIATOR GRILLES are produced in large dies. To avoid the use of small core pins, which would complicate the die and which, if broken, would hold up production and shut down expensive equipment, small fastening holes are usually drilled or punched. This setup shows eight separate drill heads built into a common fixture which includes quick acting toggle clamps.

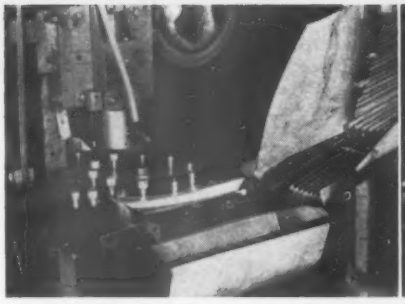


MAGAZINE FIXTURES for automatic feeding of small die castings are sometimes used to advantage. The castings are fed into the magazine with one hand and the drill is moved up and down with the chuck and spindle in the normal way with the other. A linkage advances the pieces automatically and brings them successively under the drill, which is piloted at its lower end by a drill bushing.

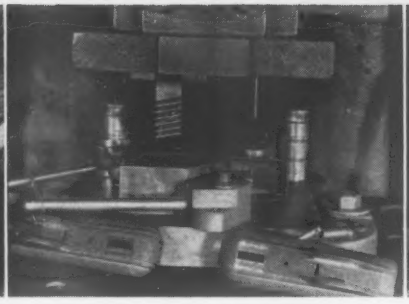


CURVED SURFACES such as found in these trunk hinges have boss holes which are not parallel. These fixtures bolted to the bed of a two spindle drill press are designed to bring the castings quickly into correct positions for drilling and tapping. The design is such that it is unnecessary to clamp the hinges in place. The fixture pivots on four links and rests upon suitable locating pins.

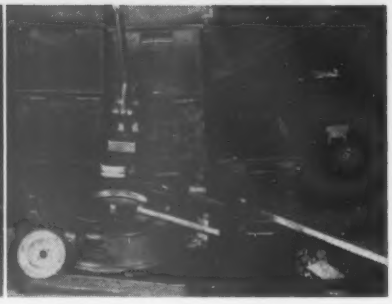
AN ANNULAR RING, in which the hole has first been reamed, is turned on its outside diameter in this drill press setup. The ring is slipped on a mandrel mounted on an anti-friction bearing and driven by a dog having three projections which mate with recesses in the casting. A carbide tipped tool mounted in a swivel rest is advanced by bar handle against a stop which determines the depth of cut.



SMALL HYDRAULIC PISTONS are sized by an external burnishing operation in this punch press. Pistons come down the chute and are set over bosses on a dial which has an intermittent motion. As each piston pauses under the ram of the press a hollow burnishing tool is forced down over the piston. A timed blast of air ejects the finished piston through a hole in the rear of the tool holder.

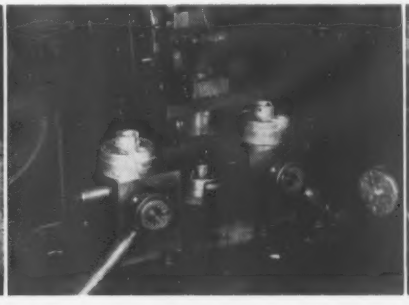


BROACHING OPERATIONS are sometimes employed to advantage. Holes which have to be sized accurately can be shaved by using a punch which acts as a broach. This zinc alloy die casting is held by a quick acting clamp. Two faces at right angles are finished by the square broach which has six lands. The lands make successively smaller cuts and leave a sharp corner as required.

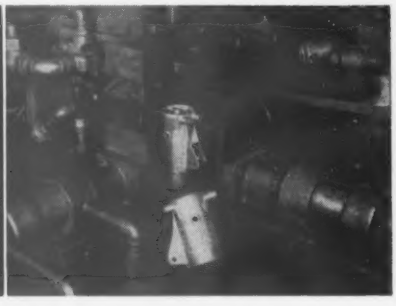


BENCH FIXTURES often save time in making light punching and shearing operations. This fixture clears the flash from 12 holes cored for spokes in a steering wheel casting. The punches are mounted in groups of four on three slides fixed radially around the hub. A lever is used to turn a cam plate with slots which advance the punches on the forward stroke, withdraw them on the return.

BARREL PLUGS are zinc alloy die cast in multiple cavity dies. After the flash has been removed at the die parting it is necessary to punch the flash from two small holes used for a wire seal. A simple linkage moves two heads, each carrying a piece of drill wire which punch the holes in the plug when it is placed by hand over the central boss. A blast of air removes the plug.

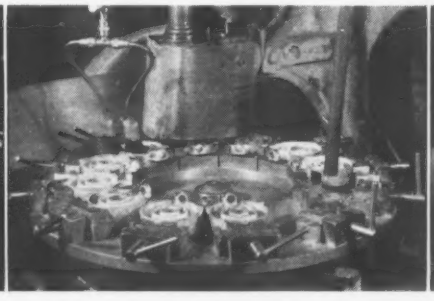


DIE CAST HOUSINGS of aluminum alloy have the flash trimmed from the periphery by the hollow punch shown, after the casting is set over the central boss. The punch is actuated by the toggle lever above it which also locks the casting while the two side punches are advanced by racks with lever handles on the pinions. These pierce holes in the hub of the housing.



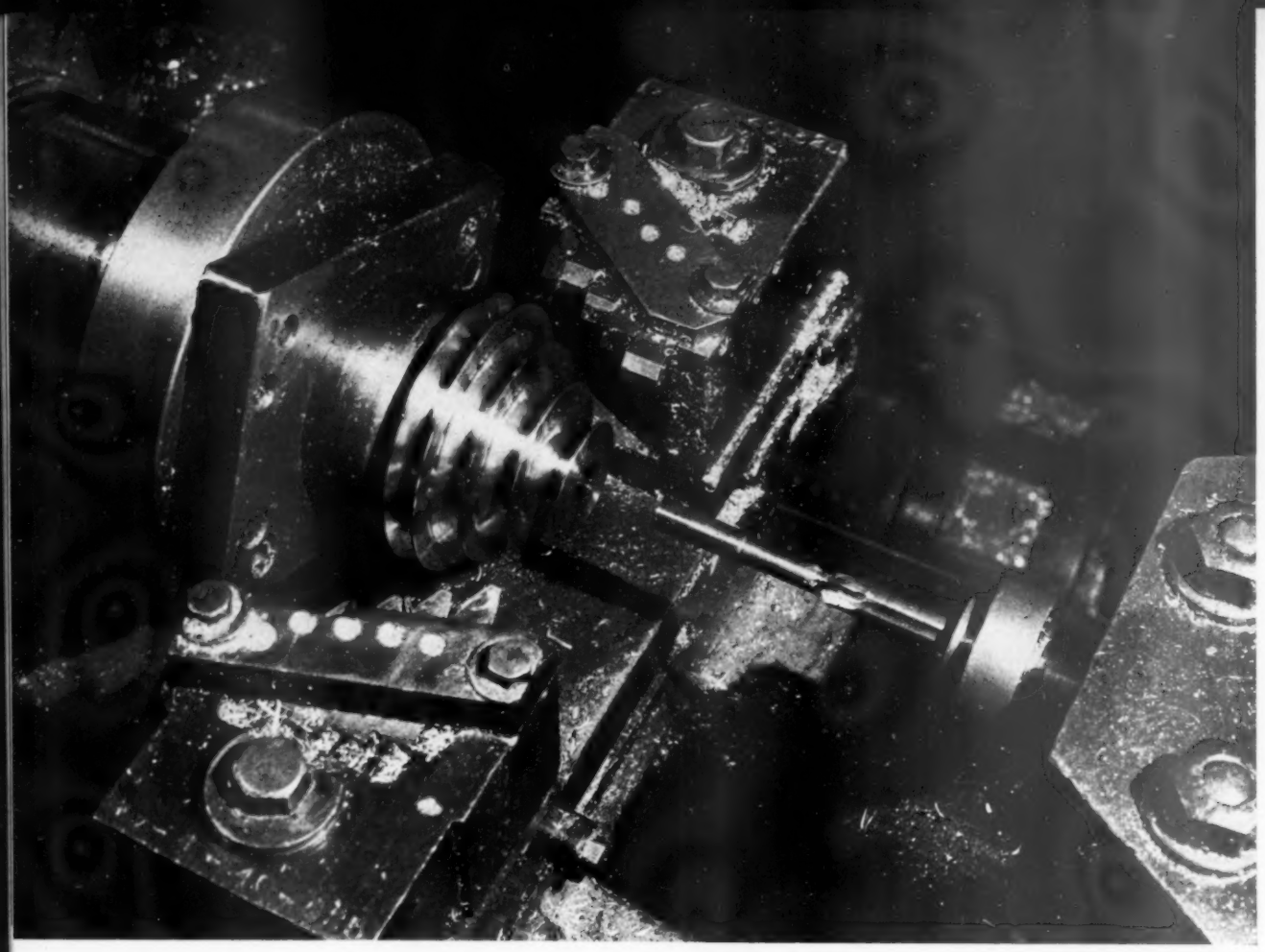
THIS ELABORATE FIXTURE has five hydraulic rams. The motor housing is placed on a central boss, the hydraulic valve opened, and the rams, each carrying one or more punches advance to clear fins from eleven cored holes at one time. The casting is removed by hand. Although more elaborate than most fixtures, the cost is justified since eleven holes are cored in 1300 castings per hour.

THESE FENDER GRILLES have a warped surface and four ears or lugs for fastening are at right angles to the face. Holes are punched in the ears with the use of the fixture shown. A toggle-operated ram with three rubber feet is used to lock the piece in place, after which each of the four punches is advanced by rack and pinion mechanisms with lever handles, difficult to do in a punch press.



ACCURATE TRUING of faces calls for the use of a cutting tool. In this instance a dial fixture is provided with clamping devices for a dozen castings. The dial carries the castings under a 4-in. end mill having 12 teeth and mounted on the vertical spindle of a milling machine. The operator uses both hands to load two and remove two castings at a time. An air hose blows chips away.

HAND FILING to remove burrs is here done at a rate of 1800 pieces an hour with the aid of a simple fixture. The parts are lock cylinders which have a burr at a point under the head. Two safe edge files are on top and below them on each side is a brass slide which moves forward against a light spring. The operator takes parts from the rear bin, moves them down the slide, which the spring returns.



Machining Aluminum « «

By
A. F. CONEEN
Technical Service Engineer
Aluminum Co. of America

IN machining a free cutting aluminum alloy very little rake is necessary; relatively heavy feeds can be employed and the chips produced by the tools are well broken and may be flushed out of the working area to a large extent by means of the cutting medium. For cutting aluminum-copper alloys it is desirable to use a rake on the tools. This should be considerably increased in machining commercially pure aluminum. In fact, the tools should have appreciably more top and side rake than those for cutting steel. The steepness of the rake angle may be an advantage in producing a chip that will clear away from the tools and the work.

Tool Materials

For machining aluminum alloys most of the tools are made of high speed steel. although in many cases with relatively low speeds tools made of carbon steel are frequently used as, for example, small diameter drills. Tools tipped with tungsten carbide give excellent results and are almost indispensable in machining aluminum alloys of a high silicon content. They have the following advantages over tools made of other materials:

1—Their cutting edges remain sharp for longer periods without grinding.

2—They produce smoother machined surfaces.

3—They can be used at a higher rate of production.

4—They maintain closer dimensions on the work.

In order to obtain the best service, it is necessary that tools made of this material conform in so far as possible to the shapes recommended for machining aluminum alloys. It is not expected that tools made of tungsten carbide are the answer to all problems in connection with machining operations, therefore care should be exercised in their selection, but when used for applications for which they are adaptable the results are very gratifying.

Regardless of the kind of material to be machined the rake and clearance angles on a tool play a very important part in machining operations. Care must be exercised in grinding so that these angles are the most desirable for a specific application, otherwise it may be necessary to greatly reduce production to compensate for faulty tool grinding. Consequently, the importance of grinding tools correctly cannot be stressed too much.

Cutting Medium

The selection of a cutting medium for machining aluminum alloys may depend entirely on the requirements of the job and the type of equipment the operation

What angle? What feed? What tool? In machining aluminum the answers are not the same as for other materials. Here is practical, tried and true information for the Tool Engineer.

or operations are to be performed in. For operations in automatic screw machines, drill presses, turret lathes, and tapping and threading machines, paraffin or mineral oil to which may be added about 5% to 10% of a fatty oil will produce satisfactory results. The viscosity of the paraffin oil may be about 56 at 100° F., the flash point between 260° and 300° F.

For general machining operations there is a wide variety of cutting mediums on the market that produce satisfactory results in machining aluminum alloys. Usually there are several factors to be considered which may largely determine the kind or grade of cutting medium most desirable for a given application. For example, in the performance of an ordinary sawing operation when the finish is of no particular importance, all that may be necessary is a mixture that will keep the tool and the work cool, and flush out the chips produced by the saw. Under such conditions a soluble mixture greatly diluted may serve the purpose and, of course, it is also more economical. However, this same mixture may not prove satisfactory in another case where accuracy and smooth machined surfaces are very essential. Generally, accuracy and smooth machined surfaces go hand in hand, because it is difficult if not impossible to hold work to accurate dimensions if the machined surface is quite rough.

Drills

For the ordinary drilling operation when the depth of the hole does not exceed about five drill diameters the standard type of twist drill (*see cut*) will produce satisfactory results. For deeper holes there are other drills on the market that are often more desirable.

The straight two fluted drill has the following advantages over the standard twist drill.

1—The chips take the form of ribbons that permit easier passage from the holes.

2—It is possible to drill a deeper hole with one entrance of the drill without breakage.

3—In many cases they produce a smoother finish.

The rake on a drill is the angle of the flutes in relation to the work. Since the flutes are straight on this type of drill no rake is provided, therefore it does not cut as freely as twist drills. In order to compensate for this condition, the drill should be ground so that the clearance or relief back of the cutting lips is at an angle of at least 20°. Although the straight fluted drill performs well in automatic screw machines and turret lathes in drilling free cutting and copper aluminum alloys, it is not recommended for drill press work because the procedure followed is quite different from that employed in the other machines.

The Slow Spiral drill is made so that the flutes are inclined at an angle of about 10°. The flutes are wider, deeper and provide more chip room than standard twist drills.

Bakelite drills were developed for drilling bakelite but this type of drill also performs well in drilling aluminum. The spiral angle is slightly slower, the flutes wider and deeper than in the ordinary twist drill.

The Fast Spiral drill has several special features as compared to a regular twist drill.

1—The margin is much narrower.

2—Clearance back of the margin is much deeper.

3—The flutes are wider, deeper and are parallel along the length.

4—The spiral angle of the flutes is about 40°.

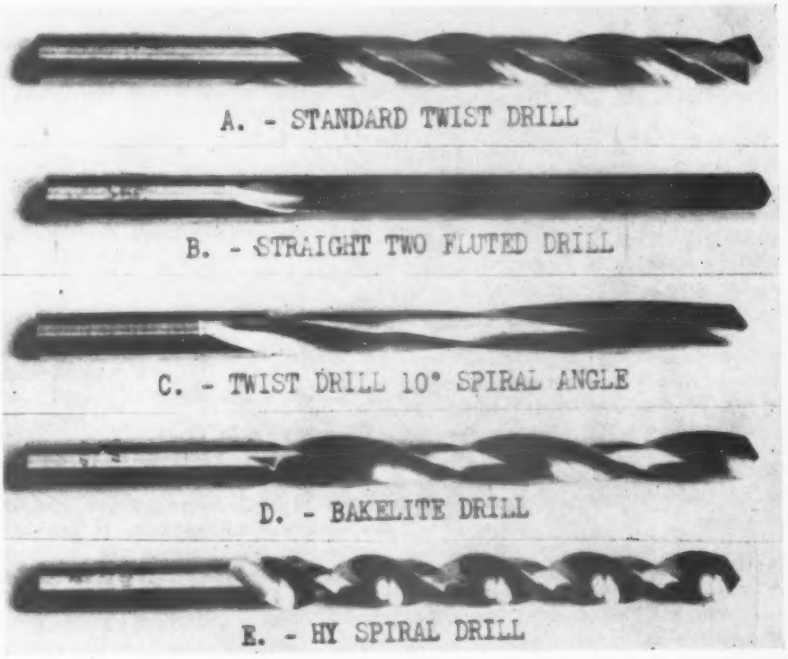
It is important that all drills for drilling deep holes should have smooth polished flutes. In many cases success in drilling deep holes may be due largely to the smooth finish in the flutes of the drill.

Universally adopted as the most suitable point for the drill for the average drilling operation is 118° although in some cases a drill ground so that the point is equivalent to 130° may be an advantage in the removal of chips from the hole. In addition the burr produced in drilling through holes may be less than when the drill has a smaller angle on the point. To take full advantage of the free cutting characteristics of aluminum alloys the clearance back of the cutting lips on twist drills may be ground at 15°.

Taps

There is a remarkable improvement in the quality of taps made today as compared to those manufactured some years ago. Not so long ago the ground thread tap was unknown, yet today a large percentage of the taps in use are of the ground thread type, particularly where smooth accurate threads are essential. These taps are ground very accurately to size and considerable care is exercised in grinding the threads to obtain an exceptionally smooth finish to minimize binding action between the tap and the material to be tapped. In addition, the flutes are ground to a smooth finish so that the chips will slide along these surfaces more freely and the face of the threads along the length of the tap are ground carefully to avoid producing burrs that may cause building up or loading of metal on or between the threads. It is evident that taps made to meet these specifications may rightly be classified as precision tools. In order to obtain the best results it is necessary for the user to resharpen and handle them as carefully as the tap manufacturer does in their production.

There are two general classes of tapping operations: blind hole and through



The Standard Twist Drill and Four Variations

hole tapping. Some thought should be given to the type of tap most adaptable for each class.

Spiral pointed taps were designed for tapping through holes, or blind holes when they are drilled deeply enough to allow clearance for chips at the bottom of the hole.

The cutting is done by the first few threads which are milled or ground at an angle to the axis of the tap. The spiral angle together with the rake or "hook" up to the cutting edges force the chips ahead of the tap, greatly reducing the risk of tap breakage due to chips clogging in the flutes. Since the chips are forced ahead of the tap it is not necessary to provide chip space in the flutes; the flutes may be made quite shallow and the strength of the tap increased. As the flutes are quite free from chips during the tapping operation, the flow of cutting medium may be directed so that it can enter the flutes, cooling and lubricating the tap and the work.

This type of tap cuts freely and usually excellent results are obtained on applications for which it is adaptable. In re-sharpening care should be exercised to maintain the original form of the angular cutting edges. The spiral point should be ground in to include the chamfer and about one full thread. It is important that the surface of the spiral point is smooth because the chips are pushed along this section of the tap on their way out.

Right Hand Spiral Fluted Taps (*see cut*) are similar in action to a right hand twist drill; that is, the right hand spiral on the tap tends to draw the chips out of the hole. This is an advantage in cases where chips at the bottom of the hole are objectionable.

For blind hole tapping when it is necessary to tap close to the bottom of the hole a bottoming tap should be used. In some cases the finish produced by a bottoming tap may not be quite smooth enough. The finish may be improved by grinding the front cutting edges on the face of the lands at a slight angle to the axis of the tap. The angle may be inclined at about 5° to the axis of the tap and to include the length of the chamfer and about one full thread. This in effect is similar to side rake and with it the tap cuts much better. However, if the angle and the length of side rake are ground in so that they are comparable to the dimensions on a spiral pointed tap, the chips would be forced ahead of the tap and, of course, this would not be satisfactory when tapping close to the bottom of a hole.

As a general guide, the width of each land on a tap should not exceed about two and a half to three times the pitch of the thread. This is an aid in minimizing friction and reducing binding action between the tap and the material being tapped. The total width of all the lands should be equivalent to about 20% to 40% of the circumference of the tap. Nearer to 20% may be preferable to allow more space for chips.

The two fluted type of tap is preferable for tap sizes up to 5/16″ and possibly 3/8″ on coarse pitch threads. For larger sizes the number of flutes recommended by tap makers is usually satisfactory. Taps can generally be used with rake or "hook", as supplied by the maker. As in the case of drills smooth polished flutes allow the chips to escape more readily.

Chasers

Chasers for self-opening die heads and collapsible taps for machining free cutting and aluminum-copper alloys should be ground so that the angle between the cutting face and front side tool is 10° to 15°. For softer and more ductile alloys the grinding angle should be increased to 15° to 35°. In addition a spiral angle ground into the front end of the chasers similar to the side rake on spiral fluted taps will force the chips ahead of the tool thereby minimizing clogging of chips inside the die head. The chamfer on the front of threading tools should be sufficient length to act as a guide in starting the tool on the work properly. This is an aid in producing smoother and more accurate threads also.

Right Hand Spiral Fluted Tap

Forming Tools

Side forming tools are used extensively in automatic screw machines and turret lathes. There are several types: circular, dovetail and flat tools. So far as rake, front and side clearance are concerned the same principles are applicable in all cases. In cutting aluminum-copper and softer alloys it is desirable to use three to five degrees top rake. A free cutting alloy can be machined without top rake. Usually it is an advantage to make the tools so that they have from one-half to one degree side clearance. This is an aid in the production of a smoother finish on the side of the work. Although, in some cases where it is not essential that the side of the work be definitely at a right angle to the formed diameter a slight negative angle may be beneficial in machining a free cutting alloy.

The speed of stock, type of tools and feeds that may be employed in machining the free cutting aluminum alloy, 11S-T3, is illustrated by the following example.

Stock size 5/8″ round. Type of machine multiple spindle. Spindle speed 3000 R.P.M. (Maximum speed of machine). Surface speed of stock 490 F.P.M. Time to produce one piece 1½ seconds.

Order of Operations	*Tool Feeds*
Box tool	.015″
Center drill	.012″
3/16″ drill	.014″
Form tool 13/16″ wide	.00155
Knurl (cross slide)	.003
Thread	
Cut-off 3/32″ wide	.004

Lathe Tools

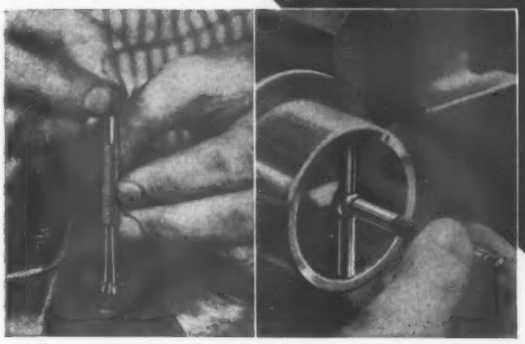
A lathe tool is used extensively in general machine shop practice, it is usually prepared from tool bit stock made of high speed steel. Due to the simplicity of the tool it can be ground to conform to shapes adaptable for machining various kinds of material. It lends itself well to machining aluminum and its alloys.

The round-nosed type of tool may be used for roughing or finishing, but its cutting edge should be honed with a fine stone before taking a finishing cut. The top rake should vary from thirty to fifty degrees, depending on the type of tool and the alloy to be machined. The clearance should be about eight to ten degrees. It is important that the tool be provided with the proper front and side clearance. Insufficient clearance will cause the tool to rub against the work and generate heat; such a tool will not cut freely. With too much clearance, the tool may tend to dig into the work and chatter. A side rake of from ten to twenty degrees greatly improves the cutting action of the tool and with it the tool cuts the metal more freely.

Usually, it is best to set the lathe tool higher on the work in machining soft aluminum alloys than when machining steel. This may mean frequent resetting of the tool where much stock has to be removed, however, it reduces the tendency of the tool to feed itself into the work in instances where there is considerable play in the cross slide and carriage.

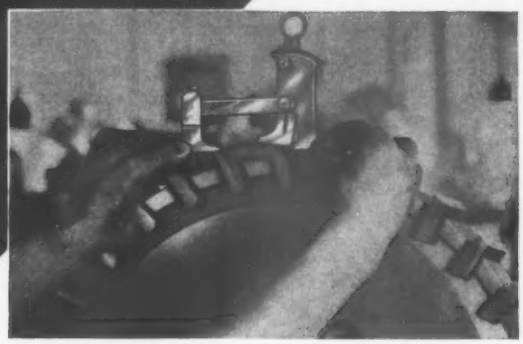
Tool holders are designed so that the tool is inclined at a fifteen degree angle which is equivalent to rake on the tool when it is fastened in the holder. Furthermore, it is advisable to set the tool somewhat above center on the work and this adds more to the effective rake. It is necessary to consider these two factors

ARE YOU DOING THESE JOBS THE HARD WAY?



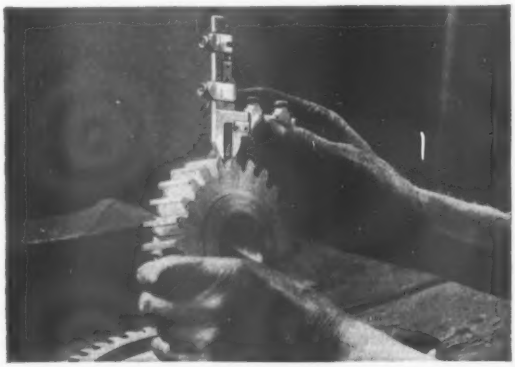
HERE'S AN EASY WAY TO HANDLE INSIDE MEASUREMENTS — ⅛ TO 6 INCHES

On work involving a number of holes, slots or grooves of different sizes, or when duplicate work must be checked for standard hole sizes, these Starrett Gages provide a quick, reliable solution. Small Hole Gages No. 829 take care of the small stuff from ⅛ to ½ inch; Telescoping Gages No. 229 handle the rest up to 6 inches. Both types can be set to a given size and used as plug gages or expanded to "feel" for close or loose fits and miked for size.



THE RIGHT WAY TO CHECK FOR CORRECT CUTTER CLEARANCE

On any cutter from 2″ to 30″ or more in diameter — end, spiral, helix, or inserted tooth — Starrett Cutter Clearance Gage No. 459 checks clearances directly and *accurately* in degrees. No need to remove cutter from grinding arbor, no fooling with protractors, etc. — saves grinding time, makes cutter work better, last longer.



GEAR TOOTH CALIPER No. 456 SAVES COMPLICATED FIGURING ON GEAR WORK

A "must" tool for work on gear teeth, gear cutters, hobs, etc. Measures both chordal thickness and addendum simultaneously — reads direct in thousandths of an inch (available also Metric by 1/50 mm.) and may be had in 20-2 or 10-1 diametral pitch.

FOR MORE TIME-SAVING IDEAS, CONSULT YOUR STARRETT CATALOG

Among the 3000 tools shown in up-to-date Starrett Catalog No. 26T are scores of new tools or familiar tools with important refinements and improvements. Look them over for ways to do more and better work. Write for a free copy.

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ATHOL • MASSACHUSETTS • U. S. A.

AVAILABLE THROUGH YOUR FAVORITE SUPPLY HOUSE

STARRETT TOOLS

when determining the cutting and clearance angles most desirable for a given job. In order to maintain the proper clearance between the tool and the work the angle between the cutting lip and the bottom of the tool must necessarily be quite large.

Milling Cutters

Milling cutters for machining aluminum and its alloys should conform in so far as practical to the general principles recommended for other types of cutting tools. The cutters for machining aluminum, with the exception of the free cutting alloys, should have more top and side rake than those for cutting steel. This is particularly true in cutting relatively soft ductile alloys. It is important that the cutting edges be sharp and free of burred or wire edges; therefore, the cutters should be ground with a fine abrasive to produce smooth surfaces. Insufficient clearance on the tool retards the free cutting action and tends to generate heat. If the clearance is too great this may result in chatter marks on the work and rapid wear of the cutting edges. However, too much clearance is less objectionable than not enough.

For the plain type milling cutter, the coarse tooth heavy duty cutter with spiral teeth, as made by most manufacturers of small tools, is well suited for machining aluminum. A three inch diameter cutter with eight teeth, deeply cut, has ample clearance for cuttings. The teeth should be made to provide a top rake angle of ten to twenty degrees, depending on the alloy to be machined and the nature of the job. These cutters are generally made with a spiral angle of about 25°. The spiral angle produces the side rake which is so desirable for the efficient cutting of aluminum because it produces a smoother slicing action. The more recent helical cutters primarily designed for machining steel, perform satisfactorily on aluminum and its alloys when the cutting edges are provided with considerable top rake. Some of these are made with a helix angle of about fifty degrees. They are used principally on applications where an exceptionally smooth machined surface is essential.

The coarse tooth type of cutter is recommended for taking heavy deep cuts since more chip clearance is provided. Cutters that have a greater number of teeth may prove more efficient for taking light cuts, because a larger number of small chips can be removed with one revolution of the cutter, the surface of the work may be smoother also. It should be remembered that the feed per tooth is one of the elements in determining the rate of production and care should be exercised in the selection of the type of cutter most desirable for a given application.

The principles as described above relative to coarse teeth with ample top and side rake should be carried out in the design of all types of milling cutters in so far as is practicable, such as straddle mills, end mills, and face milling cutters. Mills with a greater number of teeth may be used for light shallow cuts. These various kinds of cutters are readily obtainable on the market including inserted tooth cutters.

Carbon steel is satisfactory for milling cutters in some cases, but high speed steel is preferred for general shop use if there is much production involved. For relatively long production runs, cutters tipped with tungsten carbide show a marked improvement over carbon and high speed tools. Blades tipped with tungsten carbide are giving excellent results in a number of cases on large face milling cutters.

Aluminum has good machining characteristics and may be milled readily at the highest speeds attainable in milling free machining alloys of other metals. It also compares about the same in the matter of feeds and depth of cut. The best cutting speed, feed, and cut for a job depends on such factors as the type of cutter and its strength, the kind of tool material used, the sturdiness of the milling machine and the ability to hold the work securely. To illustrate the possibilities attainable under proper conditions, reference is made to heavy duty milling machines that are operated entirely satisfactorily in facing large surfaces. A face milling cutter has been employed which is over 60 in. diameter with inserted teeth tipped with tungsten carbide. It operates at a cutting speed of approximately 3000 peripheral feet per minute, at a feed of 45 in. per minute, taking a cut of ¼" to ⅜". These are special machines designed especially for this job.

Then there are other ordinary milling operations performed on light duty millers. High speed steel cutters three inches in diameter three-eighths to one inch wide are used at a speed of 2400 R.P.M. This is equivalent to a peripheral speed of 1800 feet per minute, at an average feed per tooth of about .003 inch taking cuts from .015 to .062 inch. A continuous and copious supply of cutting compound should be used, the soluble cutting oils are preferred for milling.

Circular Saws

In sawing aluminum and its alloys the circular type of saw may be rotated at a speed comparable to that which is used in sawing other free cutting alloys of other metals.

The speed of the saw may depend on several elements such as the diameter of the saw, the design, the tool material used, type of clamping device used for holding the work and the construction of the machine. A sturdy sawing machine which is designed to operate smoothly at high speeds should be used. Otherwise excessive vibration will cause short saw blade life and make it impossible to cut accurately. The machine should be provided with a positive hold-down device for clamping the work and a positive arrangement for feeding the work or the saw. With these conditions it is possible to use a circular saw ground to provide ten to twenty degrees top rake or "hook". With a positive feeding mechanism the feed of the saw or work may be adjusted in order to obtain the most desirable results in a given case.

It is good practice to follow the recommendations of the machine builder and saw maker in determining a suitable speed, because they are in a better position to know the speed at which the machine and saw can be operated safely. The speed may be controlled largely by the saw and the machine, rather than by the material being cut.

The saw may be of the solid type, individual teeth inserts, or in the form of segments with several teeth included in a segment.

As an indication of the speed that may be employed on sawing operations, a sixteen inch diameter saw is operated at 1800 R.P.M. which is equivalent to 7500 lineal feet per minute.

The clearance on each side of the saw is about 1½° for a distance in from the outer edge. The teeth are ground to give twenty degrees top rake or "hook" and alternate teeth on each side have a slight chamfer ground at an angle of sixty degrees. When a saw is prepared in this way it may be known as two point grind.

The shape of the teeth may vary considerably from those described above due to the design of the saw. There are solid saws in operation that perform satisfactorily and the teeth are all of uniform shape without any special grind on the cutting edge or lip. Then there is the three point type which means that the cut is divided among three teeth, viz. first and second roughers and the third which takes the final finishing cut. The selection of the type of saw most desirable may depend to some extent on the quantity of material to be cut, the kind of equipment available and experience accumulated in cutting metal with a certain type of saw and equipment.

Saws tipped with tungsten carbide give excellent results when used in suitable sawing machines. They produce clean accurate cuts and the cutting edges remain sharp for longer periods without regrinding. Speeds in the neighborhood of 10,000 to 14,000 lineal feet per minute may be employed.

An ample supply of cutting medium should be provided by means of a circulating system. Soluble cutting compounds have been found to be satisfactory for operations of this kind.

It is evident from the above observations that when the principles are known, it is just a matter of adjusting tool angles and tool feeds in order to obtain satisfactory results in machining Aluminum and its Alloys.

BY *Simply* CHANGING TO CARBOLOY TOOLS . . .

Turning, facing, boring Hy-Ten B3X hot rolled steel feed gear—one of the several hundred Carboloy Tool STEEL CUTTING applications in the Gisholt plant.

Production Stepped Up 30%

ON MORE THAN 1000 MACHINING JOBS AT

GISHOLT!

IMPORTANT—CARBOLOY TOOL APPLICATIONS AT GISHOLT ARE

80% STEEL CUTTING

Sharing in common with other leading machine tool builders the abrupt increase in demand that has caused the operating rate of that industry to soar from 52.5% in January 1939 to 92.5% in May 1940, Gisholt Machine Company early sought to more extensively employ cemented carbide tools as one means of increasing machining production.

To meet the problem of applying carbide tools economically on the small-lot, diversified work typical of the machine tool industry (as compared to continuous production applications), Gisholt adopted the following procedure:

1. A carbide "application man" was appointed within the plant to control all use and maintenance of carbide tools.
2. Ten basic styles of carbide tools were designed for general purpose use on 80% of the work in the shop.
3. Two grades of Carboloy—one for steel, one for all other metals—were selected for universal use.
4. A uniform method of carbide tool application was set up and adequate grinding facilities provided.

Result to date has been a 30% average increase in production on more than 1000 jobs to which Carboloy tools have been applied.

A 12-page booklet gives complete details. Write for your copy.

AGAIN—the general purpose use of Carboloy tools on small-lot, diversified work . . . PAYS DIVIDENDS!

CARBOLOY COMPANY, INC., DETROIT, MICHIGAN • Chicago • Cleveland • Newark • Pittsburgh • Philadelphia • Worcester, Mass.

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TUNGSTEN CARBIDE—TANTALUM CARBIDE—TITANIUM CARBIDE

FOR CUTTING, DRAWING, SHAPING, EXTRUDING METALS AND NON-METALLICS ★ FOR REDUCING WEAR ON EQUIPMENT OR PRODUCTS YOU USE OR MAKE

Nationwide A.S.T.E. Survey Discloses

Vital Shortage of Skilled Labor

THE BOTTLENECK: *Men*

WITH the nation emotionally aroused and the government suddenly defense conscious, the term "bottleneck" has become a favorite expression of experts and drug store cowboys alike. The bottleneck, they knowingly said, was the machine tool industry: Not enough plant capacity. Not enough materials. Not enough time.

The one thing that all the drug store cowboys and many of the experts overlooked was the available manpower. "We have," said Madame Secretary of Labor Perkins, "Ten million unemployed ready to spring to the aid of defense industries."

Some of us weren't so sure.

Ten years of famine in the machine tool industry had so discouraged apprenticeship; a sophisticated society had so disdained a trade; labor regulations had so restricted the training of new men that there were doubts as to the availability of skilled personnel.

But we weren't sure.

So the American Society of Tool Engineers undertook to find out: Is there a shortage? If so, where? How much? Some probing of the problem was done at a symposium at the New York meeting last spring. Figures were what were wanted.

So the A.S.T.E. conducted a nationwide survey among industry.

How many men do we need?

65,000 Tool Engineers.

500,000 skilled mechanics.

That is what an analysis of the first returns indicated. And that was to take care of the planned program of the next few months only. It doesn't include billions yet unappropriated or orders yet unmade.

What is being done about it?

"We find that generally speaking Big Industry has accepted the fact that it must train its own personnel and has been doing so in a way that takes care of the semi-executive group," says Ford R. Lamb in announcing the first results of the survey, "but they have not and perhaps can not take care of skilled machinists. We find that it is unsatisfactory, if not impossible, for Small Industry to institute and successfully carry out any type of apprentice training."

But the total of small industry comprises an indispensable portion of the total industry, and the efforts of larger plants are at the same time laudable and inadequate.

How did it happen?

For a number of years our educational institutions and our industry have been drifting apart until they have reached a stage where neither apparently understands the other. This has been partly caused by the policy followed at most colleges and universities. Brilliant students who don't get positions are persuaded to remain for graduate work, they are made assistants, finally professors, without leaving the cloistered walls of their college. This inbreeding, where followed, results in a broadening gap between the theories of education and the practicalities of industry.

We have built a generation of would-be white collar workers. Craft instruction has been smeared with its own grease and endured as an ignoble necessity.

But it takes more than that to down a skilled profession. Ten years of near-stagnation have offered little to the prospective apprentice. Little, that is, but a road of work and struggle that ended in unemployment and relief.

And what has it lead to?

Already we need 65,000 Tool Engineers.

And 500,000 skilled mechanics.

One third of industry needs Tool Engineers, shows the survey. More than two thirds need tool and die workers and skilled mechanics.

You can train a machine operator in a relatively short time, but a true skilled mechanic is the product of time and experience.

What can we do about it?

That is a problem we all must tackle. That is one question we don't know the answer to. You can draft a man in a second, put a gun in his hand in a minute, and teach him to shoot it reasonably well in a month.

But even if he works all day and sleeps with a handbook under his pillow at night you can't make a good Tool Engineer out of him in a year.

The educational committee of the A.S.T.E. has been studying this problem for some time and they expect soon to have definite courses of instruction prepared in the near future for use in training students.

That, at least, is a good start.

J.A.A.

TURN SHUTDOWN TIME INTO OUTPUT TIME

BETWEEN rated capacity and actual output of your machines and presses, there are two gaps. One gap is natural—caused by time lost in setting up new jobs, rest periods, etc. But the other gap is caused by the need to repair or replace worn or broken tools. In most plants, this second gap is far wider than need be—simply because tools have fallen behind modern tool performance standards. For example, here are records showing how much shutdown time was saved and how much output was gained by bringing eight old-type tools in eight representative plants up to par.

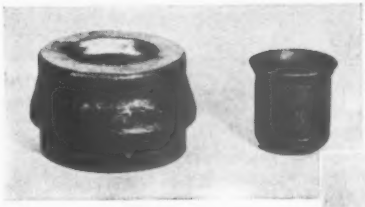
	TOOL	TROUBLE CURED	SHUTDOWN TIME RECOVERED PER MONTH PER MACHINE	EXTRA OUTPUT GAINED PER MONTH PER MACHINE
	MANDREL	BREAKAGE AND WEAR	3.7 HOURS	10,220 PIECES
	FORM TOOL	CRUMBLING CUTTING EDGE	7.6 HOURS	10,610 PIECES
	COINING PUNCH	BREAKAGE	5.6 HOURS	11,160 PIECES
	HOT DIE	HEAT CHECKING AND CRACKING	38.8 HOURS	25,200 PIECES
	PIERCING DIE	BREAKAGE	33.0 HOURS	39,400 PIECES
A	DRAW DIE	OVERSIZE WEAR	42.0 HOURS	52,500 PIECES
B	PUNCH	SCORING AND CHIPPING	53.6 HOURS	64,300 PIECES
C	BLANKING DIE	BREAKAGE	63.8 HOURS	460,000 PIECES

HOW WERE THESE TOOLS IMPROVED SO GREATLY?

In each case, the same tool maker that made the older tool made the improved tool. The only difference was that a Carpenter Matched Tool Steel, selected and heat treated by the Carpenter Matched Set Method, was used.

Carpenter's Matched Set Method can be applied equally well to your own problem of getting more from your tools. It has been successful in more than a thousand plants.

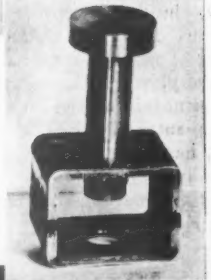
The experiences of some of these plants are told in a new Carpenter book on Spotlighting Hidden Plant Capacity. This book covers actual case records of tools—gives the "good tool formula"—explains the Matched Set Map and indicates the *quick* way for you to get a general improvement in the performance of your own tools. Without obligation, mail the coupon below for your free copy.

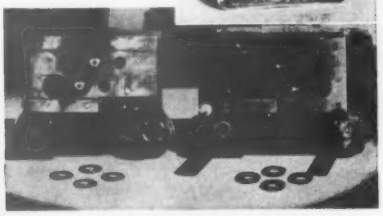


(A) *Draw Die—52,500 pieces extra output.*

Punch—64,300 pieces extra output. (B)

(C) *Blanking Die—460,000 pieces extra output.*





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Gentlemen: Without obligation, please mail me your new book on Spotlighting Hidden Plant Capacity.

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» » A.S.T.E. DOINGS « «

By IRWIN F. HOLLAND

BOSTON

Boston Chapter held its first annual outing at the Sandy Burr Country Club in Wayland, Mass., on June 22. Arrangements for the outing were made by Mr. John Sylvester, Chairman of the Entertainment Committee, and through his efforts all members and guests had an enjoyable day of golf, shuffleboard, quoits and soft ball. A group of very entertaining artists were on hand from the Yankee Network to perform for our members and guests directly after the dinner.

Many valuable prizes donated by our friends in this area were awarded for the various events as well as for door prizes and practically everybody attending left after a very busy day with a prize. Those present numbered approximately 240.

The baseball autographed by members of the Red Sox Base Ball team was raffled off by John Sylvester, resulting in the receipt of $43.20 from the proceeds of the raffle. This money was donated to the Boston Unit of the American Red Cross.

BUFFALO

The June meeting took the form of a plant visitation to Wurlitzer Mfg. Co., North Tonawanda, N. Y., which was attended by 125 members and guests. The visit not only showed what they were doing in the fabrication of metals but various diversified methods in the handling of woods, veneers and the fabrication of plastics. Through the ingenuity of its management and its Tool Engineers this plant, which in 1933 was practically idle, has been on a day and night basis for some time.

As a memento, Mr. Harry King, General Manager of the Tonawanda Plant of Wurlitzer Mfg. Co., presented to each member and guest a mahogany ash tray made up as a miniature grand piano.

COLUMBUS

The Columbus Chapter held its June meeting at Pomerene Hall on the campus of Ohio State University on June 13.

The question of holding summer meetings was discussed, and the decision of the majority was that the best interests of the Chapter could best be served by maintaining closer contact between members during the period.

Mr. Schnaitman, guest speaker for the evening, was then introduced, and he delivered an interesting talk on "Telescopes and Turret Lathes."

AUGUST MEETINGS

DAYTON — August 9, 1940. The chapter will attend the Cincinnati Reds — St. Louis Cardinals night game. Tickets $1.75 (Grand Stand). Bus $1.00. Call H. C. McMillen, Ex 8-561 for bus schedule.

DETROIT—August 16, 1940. Tool Engineers' Moonlight Cruise on S. S. Western States. Boat leaves D. & C. Dock at 8:30 P.M. Dancing and Entertainment. Men $1.00, Ladies 50c. Reservations Ty 5-0145.

CLEVELAND

The second annual golf party at Lake Forest Country Club was held on June 22, 1940. Forty-two members, their wives and guests attended, despite unfavorable weather. Those who were present enjoyed themselves both at golf and bridge. At 7 p.m. a luscious steak dinner was served in the main dining room.

Mr. Fitzsimmons, Chairman of the Entertainment Committee, managed to get control after some little time and proceeded to present the golf and bridge prizes. Bridge awards went to Mrs. C. V. Briner, Mr. T. J. Frazer, and Mrs. Ed. Mack. Golf prizes were won by W. O'Rourke and V. E. Simms (Blind Bogey), J. R. Konvichka (High gross runner up), P. Drummond (High gross), Bill Waldeck (Low putts), A. G. Merlin (Low Gross), C. Eichhorn (Poker hand), Ed Mack (Low net). Door prizes were won by Mr. and Mrs. Wm. Tabb.

DAYTON

The Dayton Chapter held its first outdoor meeting at the Inland Gun Club, July 8. Forty-two members and guests were in attendance, and, boy! did Whitey Pooch provide the old Lake Erie favorite —Golden Brown Fried Perch! It was rumored that Whitey had extended his piscatorial powers to the limit in order to provide enough for the whole crowd.

Dayton being endowed with a number of "Babe Ruths" and Christy Matthewsons" a ball game was well underway long before the fish were in the pan. The outcome is still a secret, altho there seems to be an argument as to what the final score really was.

After washing down the fish with "soda pop" a number of reels of artistic and educational films were shown with the boys sitting out in the open, slapping mosquitoes and bugs, but enjoying the cool evening breeze.

The committee, headed by Whitey Pooch, certainly worked hard to put on this fish fry and we trust that this can be made an annual affair.

GREATER NEW YORK

Greater New York Chapter held its June Meeting in the main ballroom of the Hotel Governor Clinton on June 10, 1940.

Chairman Duncan, in his introductory speech, welcomed both members and nonmembers, pointing out that the charter was still open and those who wish to become charter members would have to file their applications by the end of the evening. Chairman Duncan spoke about the composition of the Executive Committee and stated that a wide representation of industrial concerns in Greater New York was the objective. He then introduced the various members of the Executive Committee.

Treasurer, Mr. Schwister, reported on the financial condition of the Chapter. Mr. Brady spoke as Chairman of the Membership Committee and commented on the rapid initial growth of the Chapter and the increasing interest being

Larry Howe (right) receives the trophy from George Whitehouse, chairman of the entertainment committee, at the Detroit Chapter Golf Tournament held July 20 at Bonnie Brook. Four past presidents of the A.S.T.E. (Walter Wagner, Joe Siegel, Bill Smila, and Ford Lamb) were among the two hundred who attended.

Get the most

FROM YOUR END MILLS AND MILLING MACHINES . . . WITH A MILWAUKEE MIDGETMILL

THE Milwaukee Midgetmill is specially designed to get the most from end mills and milling machines by providing the correct high speeds that mean smooth, clean, accurate work and long tool life. Adaptable to any milling machine — completely universal —mills, drills and bores—fast, safe and easy to set up.

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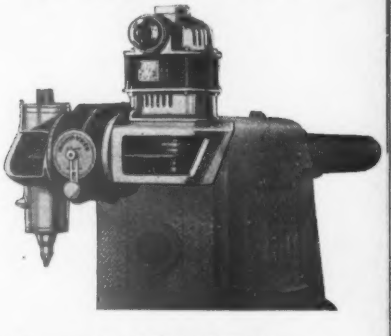
—exclusive with the Milwaukee Midgetmill. Set cutting tools by direct reading — merely touch tool to work, set dial at zero, and mill, drill and bore until dial shows correct reading — in thousandths. No graduations — no dials — no stops — no binding screws. Accurate to plus or minus .00025 inch in its 2½ inches of travel.

THE MILWAUKEE SPEEDMILL

— for end mill speeds up to 5200 r.p.m. Accurate, easy to operate, improved finishes. Adapted to all types of milling machines.



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MILWAUKEE MILLING MACHINES

A. S. T. E. DOINGS

(Continued from preceding page)

shown in its activities. He also announced that a prize would be awarded to that plant representative who brought in the greatest number of new members by the end of the Society's year, March 1, 1941. Mr. Russell of Russell, Holbrook & Henderson won the door prize which was a copy of MACHINERY'S HANDBOOK.

Mr. Palmetto, Chairman of the Meetings Committee, announced that the next meeting would be held on September 9 and that Mr. C. B. Johnson of the Pratt & Whitney Division would speak on the subject, "Gages—Their Technical and Economical Importance."

About 225 including eight members from visiting Chapters attended the Technical Session.

LOS ANGELES

Los Angeles Chapter celebrated its first anniversary June 27. with open house to two hundred and twenty-five members and guests held through the courtesy of the Machinery Sales Company at whose sales-rooms thirty Tool Engineers gathered one year before to form a western Chapter.

Mr. D. N. Macconnel acted as master of ceremonies for the above-mentioned concern which served refreshments and a fine dinner with roast beef which the program stated was "Sliced on the Do-all Saw—not with a razor blade."

It certainly was not and the ice-cream birthday cakes served "right from the rivet refrigerator" shows what progress western Tool-Engineering is making.

Much credit is due our Treasurer, Jack Marvin for this birthday party, as his achievement of having rounded up the founders group in June of last year, makes him a good deal of a "papa" to the local Chapter.

Moving pictures and vaudeville entertainment spotted the evening's progress and felicitations upon the Chapter's future were generously passed around.

This meeting followed closely upon the first annual picnic held at Griffiths Park, June 15. for the members and their families. Approximately three hundred people thronged the pepper grove. Broadcasting facilities kept the crowd in touch with the many events through the hard-working activities of Roy Watkins, Master of Ceremonies.

Los Angeles Chapter has every reason to be proud of its first year's record. Its goal in the second year of its existence will be that of making it the second largest Chapter in the A.S.T.E.

NEW YORK-NEW JERSEY

The New York-New Jersey Chapter held its annual stag picnic at Doerr's Grove in Livingston, N. J. on Saturday, June 29. Beer and various kinds of food were served all day and while everybody who attended had an exceptionally good time, the affair was marked by the total absence of anyone displaying over indulgence. Athletic events requiring good fortune rather than skill were conducted throughout the day by Charles Bazaz of Wright Aeronautical Corporation.

A soft ball game was played between Wright Aero. and Hyatt Roller Bearing resulting in score of 12 to 9 in favor of Wright Aero. The players on the winning team were LeBean, Pfeffer, Pagano, Nolds, Crist, Rohm, Archibold, Lunzer, Schaefer, and Uslendors, and managed by Charles Bazaz. Each of these received a new Adam Hat as a prize. The golf chipping contest was won first by Ed. Bednarz, second by J. Schaefer, and third C. L. Thompson. In the nail driving contest conducted by Frank Sheeley, R. J. Hyder was first, Gruchay second and Frank Delhagen third. The winning Horse Shoe team was W. H. Bedell and Stan Gruchaz first, and R. R. Sacksteder and R. H. Kuzel second. The Shot put was won first by Zurcher and second by Mr. Kuzel of Detroit Chapter No. 1.

A 100-yard dash was staged on the "here to there" basis and was won first by Jarvis and second by Egerly.

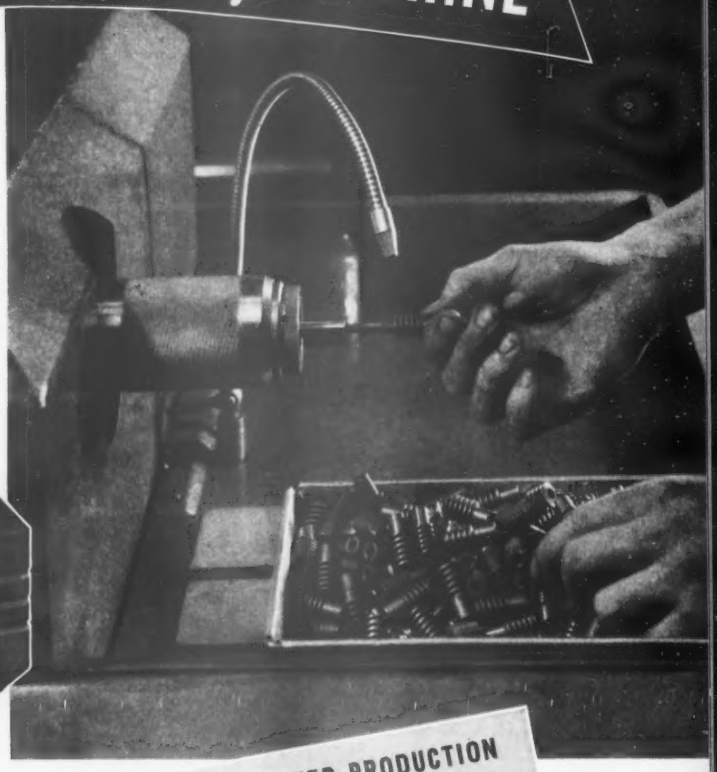
All the winning men listed received very acceptable prizes for their efforts and a large number of door prizes were awarded. All these prizes were the generosity of locally represented firms. The picnic was managed in the greater part

(Continued on following page)

Precision HOLE LAPPING NOW ECONOMICAL... *with*

EX-CELL-O *Internal Lapping* MACHINE

Exclusive advanced design of stones and mandrels, plus extreme ease of operation and control, makes it possible to finish holes to close limits on this Ex-Cell-O machine at low cost with high production. • Due to far greater stone contact area, ordinarily difficult and expensive grinding and finishing operations, such as holes interrupted with keyways, slots, etc., are precision lapped on this Ex-Cell-O machine just as easily as plain holes . . . stone wear is greatly minimized . . . the necessity for frequent checking and resetting is reduced. • Initial cost is surprisingly low. Send for complete information.



BETTER JOB . . . GREATER PRODUCTION

Worm shown lapped on Ex-Cell-O Internal Lapping Machine by Gear Specialties, Chicago. Former bellmouth conditions eliminated and production increased 50%.

PART—Worm blank • MATERIAL—4615 SAE steel, carburized and hardened • STOCK REMOVED—.0005" • SIZE OF HOLE—.21875" • TOLERANCE—.0003" • PRODUCTION—from 90 to 100 parts per hour.

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EX-CELL-O MACHINES AND TOOLS

XLO *Precision*

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Please send Bulletin 41102 on the Ex-Cell-O Internal Lapping Machine.

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A. S. T. E. DOINGS

(Continued from preceding page)

by our Chairmen, Wally Gray and Wilson Ryno of the membership committee who were very conscious of their amateur standing before the day came but now have the complete confidence of professionals.

PITTSBURGH

At the June meeting plans were discussed for the July picnic to be held on July 19, Chairman Owens of the Meetings Committee introduced R. S. Drummond, President, National Broach and Machine Company of Detroit, who gave an interesting talk on "Roto Milling," explaining types of cutters and giving an interesting description of the machine. Al Froberg explained the numerous applications for broaching and the type of broaches and machines used. Fifty members were present at the dinner and sixty at the meeting. Our own Jim Weaver, Past National President, was among those present.

ROCHESTER

The Rochester Chapter held its third annual Picnic on June 22. Three hundred plus members and friends of the Chapter had a "swell" time along the shores of Irondequoit Bay. With Chairman John Dense at the head table was also Vice Chairman Oswell of the Cleveland Chapter, who was a surprise guest. Mention should also be made that newly married Secretary Roessel was able to make this picnic.

A well organized program of athletic events followed the steak dinner. After all the events were run off, various prizes for the winners were presented. Herb. Simons of Delco won a well-deserved prize as well as the appreciation of the society by selling 78 picnic tickets.

The ball game "Toolsters" vs. "Stoolsters" was a hard-fought affair. "Toolsters"—48, "Stoolsters"—16. No record of errors is available. Hitting the nail on the head was demonstrated in fact by Ernie Kepler of Camera Works. He drove the spike down in the unofficial count of four blows.

The whole party was reported by everybody as a real success, and the committee certainly is to be congratulated on the fine arrangements, as the dinner was spoken of in the most complimentary terms by everyone.

TOLEDO

The June meeting was held on June 11 at the Toledo Yacht Club. Dinner was served at 7 o'clock and the technical session was called to order at 8. Past Chairman Erhardt introduced Carl Ostrosky, who gave a treatise on Heat Treatment of Tool Steels (*see page 36*). C. R. Staub, Chief Engineer of the Michigan Tool Company spoke on "Ground Form Finish Hobs." Sixty-six members and guests were present.

TWIN CITY

The Twin City Chapter held its June Meeting on June 19 at the Anthony Commercial Club. This meeting took the form of a ladies night—social, and no business was transacted.

After dinner, the Chapter Chairman, Mr. George Wise, gave an explanation for the benefit of the ladies of the beginning and the growth of the A.S.T.E. They were entertained by Don White, Magician, having enjoyed the show of talking pictures of deep sea fishing from shell fish to whales. Pictures were also shown of the Heavy weight title bout of Joe Louis.

The Highlight of the evening was the drawing of door prizes, which were donated by local firms and members. These prizes were so numerous that nearly every couple received one. Mrs. Guy Mackley won the grand prize of $5.00. We have a suspicion that Guy, who pulled the numbers out of the hat, had a lesson in prestidigitation from the magician who appeared previously on the program.

The remainder of the evening was devoted to bridge, pool, billiards and conversation. Speaking of pool, Eric Anderson, who by his own admission, was quite a shark when a young fellow had to concede that his youthful skill at knocking the balls in the pockets was, after all, just a memory. This was the last meeting of the season, the next meeting being scheduled for September.

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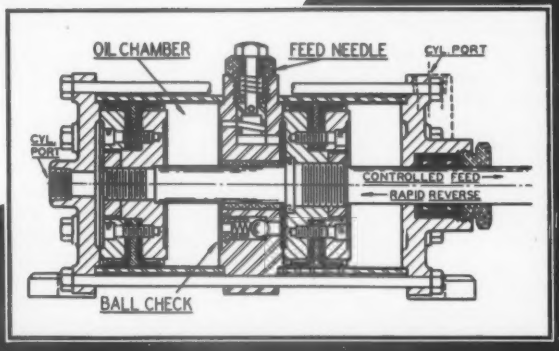

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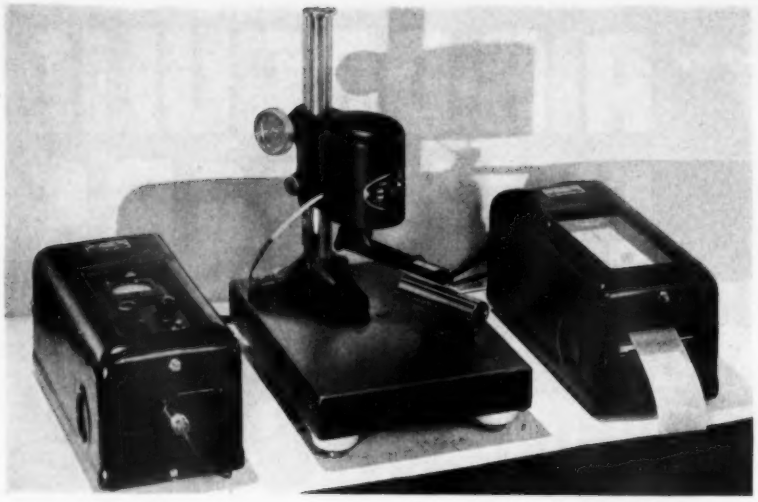

Analyzer head and drive mechanism are shown at center, connected through the calibrating amplifier at left to the direct-inking oscillograph at right.

The Brush Surface Analyzer, which provides topographic charts of the surfaces of finished parts accurate to less than one microinch, latest answer to the problem of specifying finishes.

Recording Surface Finish

A MAJOR difficulty in comparing surface finishes has been the absence of a practical means of making accurate records of the relative smoothness or roughness of a given surface. It has been known for some time that a dull looking finish may actually be smoother than a shiny one, but with this in mind surprising results can be obtained visually or by running a finger nail over the surface.

However, more accurate analysis was needed and in 1934 a laboratory method of tracing surface profiles was developed and in 1938 a method of generalizing surface irregularities in "topography" came into use which produced a roughness factor. These had disadvantages. The apparatus was delicate and required a laboratory set-up—in the earlier instrument—and only a very small sample could be used.

In the method most commonly employed there was no way of actually analyzing the surface. Rather the instrument gave a running average of the variations from the mean surface with disregard as to whether they were heights or depths. This was actually a root mean square value comparable to the r.m.s. reading of an alternating current voltmeter. The reading was never the actual value of the maximum variations. On the basis of experience it was possible only to *estimate* what these maximum irregularities were. Neither did the instrument give a true picture of the topography of the surface.

Surface Analyzer

Until recently there has been no instrument available for shop use which could accurately analyze surface finishes. Now the Brush Development Company of Cleveland, Ohio has developed an instrument which possesses relative portability and ruggedness and yet analyzes surfaces accurately to dimensions of less than one millionth of an inch or microinch. The instrument consists of four parts and can be packed into two carrying cases. It operates from an ordinary 110 Volt 60 Cycle alternating current outlet. The four parts (*see cut*) are an analyzer head and surface plate, an amplifier and a direct inking oscillograph.

The *analyzer head* consists of a pickup arm and drive unit mounted on an adjustable stand. The drive unit provides the necessary horizontal motion to the pickup arm in order that it may explore the topography of the surface under test. The pickup arm contains a piezo-electric crystal actuated by a sapphire needle or tracer point, and is constructed quite similar to a delicate phonograph pickup.

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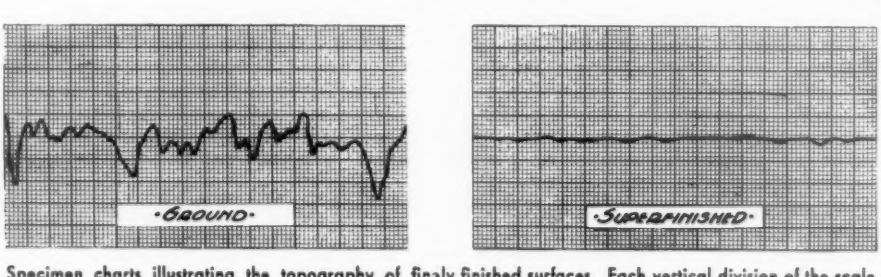
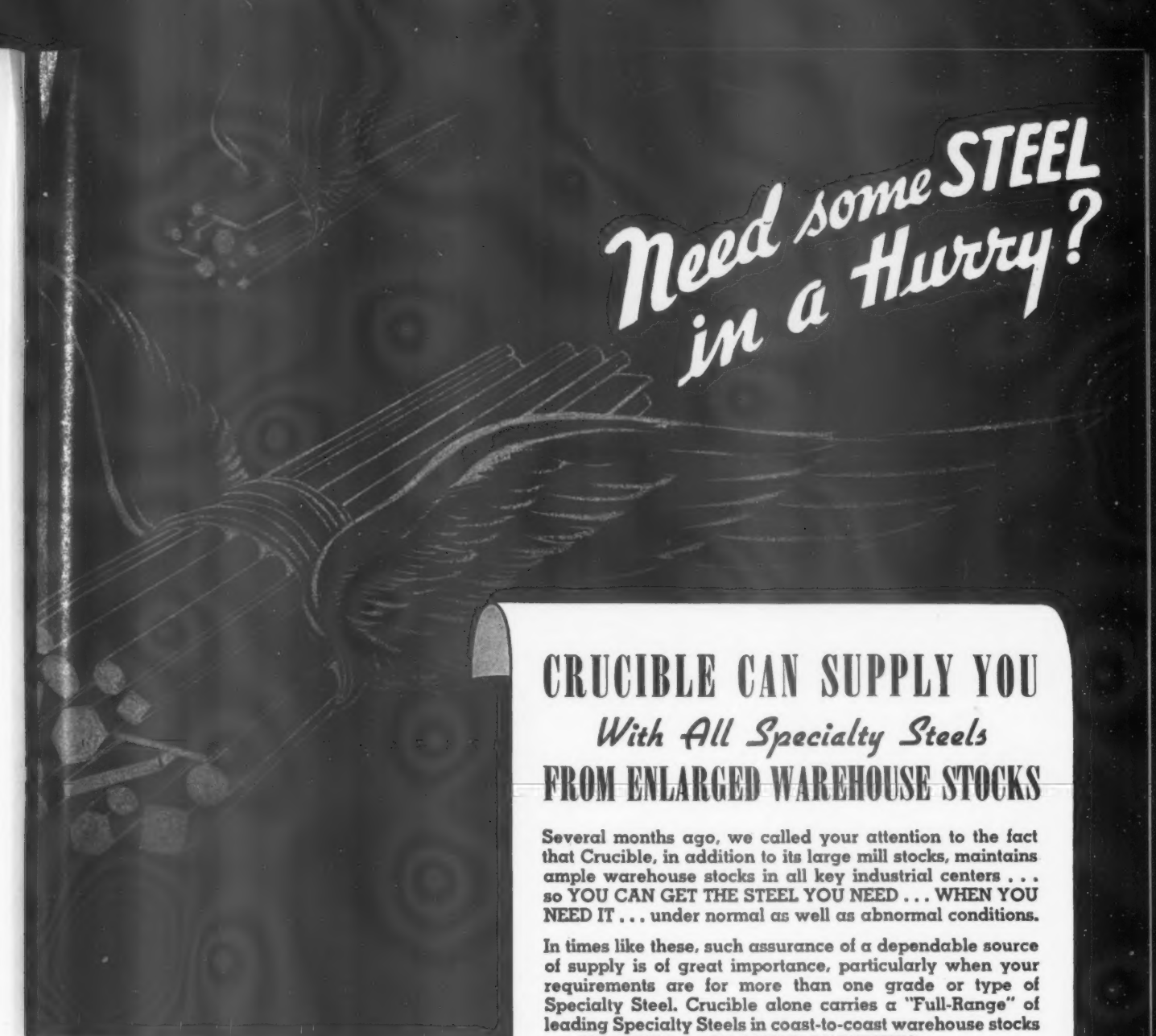


Specimen charts illustrating the topography of finaly finished surfaces. Each vertical division of the scale is equal to one microinch.



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SURFACE FINISH

(Continued from preceding page)

The tracer point, which has a spherical radius of .0005", is mounted in a tubular lever arm, and is adequately protected from mechanical damage by a hardened steel finger which carries a positioning shoe. The positioning shoe rides over a relatively large area of the surface under test, establishing a reference level for the tracer point and supporting the weight of the pickup arm.

The vertical motion of the tracer point, caused by the irregularities in the surface, is transmitted to the piezo-electric crystal which generates a voltage between its electrodes directly proportional to the vertical motion of the tracer point. This voltage, which is in the order of .0012 Volts per microinch of deflection, is then applied to the input of the calibrating amplifier.

The drive unit, which provides the motion for the pickup arm, contains a 110 Volt 60 Cycle alternating current synchronous motor. This unit provides a straight-line reciprocating motion .060" long in each direction. This motion is accomplished at a uniform velocity and one complete cycle requires ten seconds.

The *calibrating amplifier* is a specially designed two-stage type, operating directly from 110 Volts 60 Cycles alternating current supply. The amplifier supplies all the necessary gain (magnification) between the pickup arm and the direct inking oscillograph. A calibrated step-type attenuator is included which provides various degrees of overall magnification of the surface irregularities so that they may be readable on the chart (viz: 40,000:1, 4,000:1, etc.) With maximum amplification it is possible to obtain deflections on the chart of 1½ mm. (approximately 1/16") per microinch of tracer point deflection.

A calibrated circuit is also included, which supplies a "test" voltage for adjusting the gain of the amplifier to provide any desired deflection on the oscillograph chart, accurately correlated to the sensitivity of the pickup arm. The output of the amplifier is connected to the direct inking oscillograph by means of a five-conductor shielded cable.

The *direct inking oscillograph* makes a graphic record of the irregularities of the surface under test as explored by the pickup tracer point and magnified by the calibrating amplifier. The oscillograph is equipped with a direct inking pen actuated by a crystal element which is thermostatically controlled for stabilization. This crystal element operates conversely to that used in the pickup arm. The motion of the oscillograph pen, since it is actuated by a piezo-electric crystal element, is proportional to the magnified voltage supplied to it by the amplifier. Consequently, the motion of the oscillograph pen is proportional to the original motion of the tracer point very much magnified by the mechanical and electrical systems.

The crystal-driven pen is designed for stiffness and low mass, which enables it to respond to rapid fluctuations up to 60 or more cycles per second. A maximum deflection of approximately 15 millimeters, or about 5/8" each side of the zero axis, is allowable. The fluctuations of the pen are recorded on a moving paper chart which is driven by a 110 Volt 60 Cycle alternating current synchronous motor, operating through a gear train. The latter provides a selection of one of three rates of feed, as follows:

Speed	*Horizontal Magnification*
5 mm. (approx. 1/5") per sec.	16 times
25 mm. (approx. 1") per sec.	80 times
125 mm. (approx. 5") per sec.	400 times

For most purposes, a speed of 25 mm. per second has been found to provide the most easily interpreted chart.

The Brush Surface Analyzer appears to be a practical means of quickly and accurately recording surface topography. Providing another instance of the application of a familiar principle to new uses, it should be of especial interest to surface-conscious Tool Engineers.

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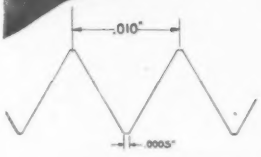

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The Treatment of

Tool Steels

By CARL F. OSTROSKY

THE heat treatment of steel consists in the heating and cooling of metals at definite rates in order to change its physical structure or condition. Many objects may be obtained by correct heat treatment, but a great deal cannot be expected unless the man who directs these operations knows the essential difference between a piece of steel at room temperature and a piece which is red hot, other than the fact that the latter is hot.

The science of metallography has been developed in the last twenty-five years, and aided by very precise methods of measuring temperature, has done much to systematize the information we possess on metallic alloys, steel in particular. Steel is hardened by quenching from above the critical range. Apparently the quick cooling prevents the normal change back. The temperature of the steel depends on the type of steel and the purpose for which it is intended.

The use of the pyrometer is the proper method of determining the temperature for hardening, although the use of color charts may be used if properly studied, provided a pyrometer is not available. The critical point can also be determined by use of the horse shoe magnet; simply touch the steel with a magnet during the heating and when it reaches the temperature at which the steel fails to attract the magnet, the critical point has been reached. This is the lowest point at which steel will harden. However, if a slightly higher temperature is reached before quenching, a satisfactory hardness will be attained. This method applies only to carbon tool steels and will not work on High Speed Steel of to-day.

The Cyanide Bath may be used for heating tool steels, as the temperature can be controlled within a three degree radius. The steel is evenly heated and not exposed to air, diminishing the possibility of warpage and scale. However, this is not advisable on all tools due to odd and intricate shapes, such as very thin and sharp edges, causing possible chance for extremely hard edges and possible breakage.

In the hardening of tool steels, it makes no difference how well equipped the hardening room may be, the proper hardening depends on the "human factor"—the man in charge—how well he knows his tool steels, and his ability to follow instructions, ordinarily given with most brands of tool steels or furnished by the steel manufacturer on request. The following facts should be taken into consideration, when hardening tool steels, and adhered to closely.

Take time in hardening. Uneven heating, and poor quenching cause a loss of many valuable tools and dies on which many dollars in material and workmanship have been spent. It surely is worth the time and caution to properly harden these tools. A good hardener takes pride in the quality of work he turns out; he is a valuable asset to any manufacturer and should be paid in accordance with his ability.

If a piece of steel is overheated a very coarse crystalline structure will result, especially if the steel is overheated to any great degree. This is caused by the burning of the carbon content. To restore this same steel, provided it is not too greatly overheated, one should anneal the steel and permit it to cool very slowly in order to restore the steel to its normal state, then proceed again with the hardening process.

Uneven heating causes a wider margin of hardening depth on one side.

The temperature of the cooling bath should be between 50 and 75 degrees F. Some will harden best in brine, but good cold running water will give splendid results. When quenching long, slender pieces of work they should be quenched vertically and moved up and down and sideways to prevent the work from becoming distorted.

Pieces of work having tapped holes in them or holes that need not be hard, should be packed with fire clay or wick asbestos to prevent cracks from starting from such holes, especially if they are near the edges of the parts to be quenched. Thin and very delicate sections may first be quenched in oil until black, and then quickly immersed in oil to eliminate any possible breakage.

An important point to remember in the hardening of carbon tool steels is that they should be drawn as soon as possible because the cooling of the parts may set up an internal strain and cause the steel to break or crack. Carbon tool steel, as it is commonly called, contains from 80 to 125 points or 0.80—1.25 per cent of carbon, but none of the alloys that are contained in high speed steel. These have various temper numbers, designating various uses, a typical set of which follows:

No. 3—0.60-0.69 carbon called die temper.

No. 3½—0.70-0.79 carbon used for chisels, punches, shears, etc.

No. 4—0.80-0.89 carbon used for large taps screw and header dies.

No. 4½—0.90-0.99 carbon used for general purpose, dies, arbors, centers and small punches.

HEAT TREATING

(Continued from preceding page)

No. 5—1.00-1.09 carbon, called axe temper and used for small taps and small chisels.

No. 6—1.20-1.29 carbon, called tool temper and used for engravers, picks, drills, taps, milling cutters, drawing dies for fine wire, etc.

No. 6½—1.30-1.39 carbon, called hard tool temper and used for razors, and small drills such as wire gauge and dentist.

No. 7—1.40-1.49 carbon, called razor temper and used for razors, special lathe tools for turning chilled rolls, chisels and punches.

The last three mentioned are not weldable and such should never be attempted. However, No. 5 and No. 5½ tempers are weldable with extreme care.

In forging carbon tool steels extreme care should be used. The steel should be forged at bright red heat using light blows; when the heat runs out and the steel is black do not hammer as this is liable to cause surface cracks. The piece should be reheated and, when forging is finished, permitted to cool slowly—reheat to a dark red heat or about 1380 degrees to 1440 degrees, depending of course upon the carbon content, and quench in luke warm water and draw back to the hardness required.

Annealing

Steel to be used for parts subject to stress must be prepared for ready response to the heat treating operation required to bring out its physical properties. Steel hammered in the mill and forged in the blacksmith shop is left hard and brittle and is not susceptible to the hardening process.

This condition is overcome by annealing which removes the hardness by careful, uniform heating and slow cooling. The operation restores the steel to a state of softness and ductility absolutely necessary for the satisfactory machining of blank stock and heat treatment of tools, dies, and machine parts, etc.

"Anneal" generally means "to soften". In the case of glass this is brought about by heating and then cooling slowly, which renders the glass less brittle. The same idea applies to steel hardened by hammering or rolling, or brittle through strains set up in the steel by stamping, punching or drawing operations. The steel, if heated to its critical temperature and allowed to cool slowly, tends to recover its malleability. The treatment brings it to its softest state, preparing it for further operations.

Annealing to remedy structure should always be carried out before machining operations are started. Annealing before quenching or drawing minimizes the possibility of warping and shrinking. When heavy machining operations are performed, a light anneal is helpful before hardening to avoid warping. The finishing machining operation should be performed after this light anneal.

A satisfactory method for annealing carbon tool steel is to pack the pieces in a cast iron box or large pipe between layers of granulated charcoal or carburizing compound, so no two pieces touch each other or sides of the container. Leave one-half inch between the steel and the walls of the box or pipe. Secure the cover tightly, place in furnace and bring to the proper heat according to the carbon content of the steel, making sure that all parts are thoroughly heated. This method tends to slightly carborize the steel which is a material help in the machining and subsequent heat treating operations. The time required depends upon the size and quality of the pieces.

A piece of high-grade tool steel an inch in diameter, for instance, should remain at a temperature of from 1475 degrees to 1600 degrees F., depending on the carbon content of the steel, for one hour after the box is thoroughly heated through, with a proportionately longer time for larger pieces. Let the box remain in the furnace and cool with it. Cool slowly, and do not remove from the box until parts are perfectly cold.

Another method for annealing carbon

(Continued on next page)

HEAT TREATING

(Continued from preceding page)

tool steel that is very successful, is to place the work in the furnace cold, without packing, and heat to 1480 degrees. When the stock has reached this temperature, remove to another furnace previously heated to 1292 degrees. After the work has received a thorough heating at this temperature, shut off the burners entirely and allow to cool. In this method the steel is softened enough for the most particular work and excellent results are obtained in the hardening operations.

The best temperature for carbon steel annealing is from 1300 to 1750 degrees F. This is known as the refining heat, giving the finest grain when hardened. Of course the heat varies with the carbon content, as follows:

Carbon Content	*Temperature*	*Color*
1.5%	1300 deg. F.	Dark Orange
1.0%	1500 deg. F.	Medium Orange
0.5%	1750 deg. F.	Bright Orange

The annealing of High Speed Steel can be accomplished very nicely by heating thoroughly to about 1600 deg. F. and cooling slowly, the same as carbon tool steels.

A short method that the hardener may use is as follows: Heat slowly until the steel passes the transformation point, approximately 1600 deg. F. Hold at this heat, but no longer than from five to ten minutes according to the size of the piece, then bury in ashes, asbestos, or slacked lime to cool.

Here is another process which is very satisfactory: Place in a furnace heated to about 750 deg. F.; raise this temperature slowly to 1300 deg. F., holding for about thirty minutes; then remove from furnace to air cool. This operation should not take over one hour for a piece one inch square.

Some of the important things to remember in annealing are:

(a) Do not heat too long; heat only long enough to penetrate, then turn off heat immediately.
(b) Do not overheat.
(c) Heat slowly and cool slowly.
(d) The slower the heat the greater the success.
(e) Uniform, even heating is essential for the best results.

High Speed Steel

High Speed Steel is an expression very commonly heard in the shop of to-day, and it generally is applied to a piece of steel which gives excellent results and service rather than to the specific type of style which it signifies. High speed steel is a Tungsten steel which possesses the distinctive property of red hardness, being able to retain a cutting edge while heated to a temperature which would ruin the best carbon tool steels. Such properties are obtained only by a correlation of suitable chemical compounds and proper heat treatment.

The components of high speed steel are confined within fairly close limits. The average analysis of most American made high speed steels is as follows:

Carbon	.....67%	Tungsten	..16.78%
Manganese	..28%	Chromium	. 4.26%
Silicon	.....21%	Vanadium	. .86%

The aim in hardening high speed steel is to obtain an austenitic or polyhedral structure which is free from the particles of carbide which are characteristic of annealed high speed steel. In order to accomplish the solution of this carbide, there must be a temperature of at least 2250 deg. F. to 2275% deg. F. for most steels. Pieces heated to 2000 deg. F. or 2150% deg. F., and quenched, do not accomplish this result unless held at those temperatures thirty to forty-five minutes or more. To heat a high speed tool to 2300 deg. F. and hold it there for any length of time would produce a worthless tool. The first rule in treating high speed steel is that the high temperature must be applied only as long as necessary to heat the steel through.

Better results are obtained, and the danger of cracking or checking minimized, if the part or material to be hardened is first preheated in an oven furnace to a temperature of 1600 deg. F. to 1700 deg. F. and immediately removed

(Continued on next page)

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HEAT TREATING

(Continued from preceding page)

to the high speed furnace which is heated to a temperature of from 2250 deg. F. to 2275 deg. F., keeping it at this temperature only until the work is thoroughly heated through.

The quenching should be done in oil, free from water, until the oil ceases to flash on the surface of the piece. Keep the tool or parts in motion until thoroughly cooled. Select your quenching oils carefully for quenching high speed steels as considerable trouble is often experienced through the use of an unsuitable oil. Oil should be selected to give a uniform quenching speed, not oxidizing or thickening with repeated use, or producing gaseous vapors at low temperatures.

After tools are immersed in oil, and the red color disappears, quickly place the tool before the furnace door and allow the oil on the tool to catch fire, repeating the process several times. This operation relieves the strain on the outer edges caused by the quenching operation.

A lead bath may be used in place of oil for quenching. Pre-heat and heat the work to 2275 deg. F. as previously directed, and immerse in the lead bath at a temperature of 1100 deg. F. Tools cool more rapidly by this method than in oil and are also harder.

When the nature of the tools will permit, they may be removed from the furnace and placed in a dry air blast. A heavy scale will form, but when the red disappears, this scale will shed, leaving the surface gray and fairly smooth. If then reheated, or drawn, at 1100 deg. F., the tool will be as hard as if cooled in any other way.

Tempering

Tempering in heavy oil is the usual procedure; 400 deg. F. to 630 deg. F. is the average range of temperature, the latter being for dies subject to considerable shock. Medium sized drills quenched at about 2260 deg. F., and drawn in oil at 480 deg. F., for half an hour give excellent results. Tool holder bits should be quenched at 2300 deg. F. and drawn about 1100 deg. F.

Many favor a higher temperature, using up to 900 deg. F. with excellent results. The temperature heat suited can be learned by experimenting.

The lead pot is also used for tempering. Heat the lead to the melting point, then take the chill out of the tool you wish to temper or draw before placing in the pot. When the temperature of 1100 deg. F. is reached, hold the tool down under the lead from one to three minutes according to size; remove and allow the tool to cool in the air. If a lead pot is not available, use a gas or oil fired furnace and bring the tool slowly up to 1100 deg. F.

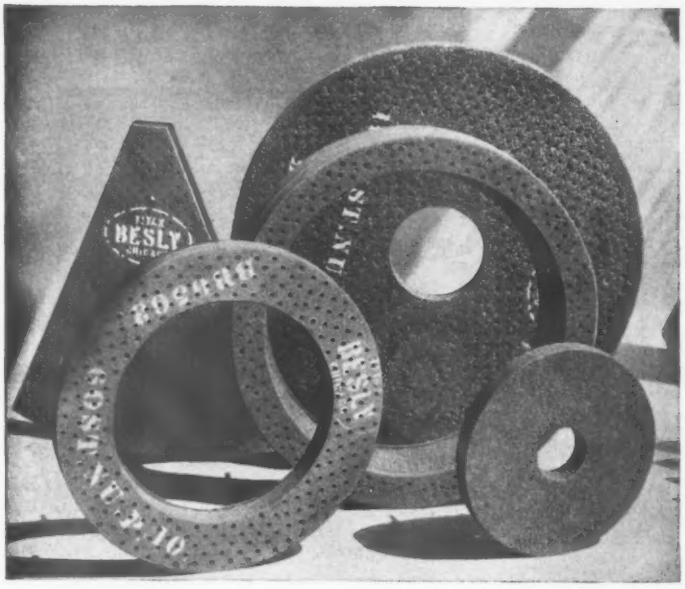
Tempering or drawing at 1100 deg. F. has been shown to increase the durability of the tool 40% or more, and adds strength and elasticity that practically eliminates the breakage danger.

The proper heat treatment of high speed steel requires furnaces with minimum heat radiation; a thorough penetration of the work, with no danger of its being touched by the flame; a fuel supply giving constant and even heat; a temperature control permitting the necessary degree of heat to be reached steadily and maintained accurately thruout.

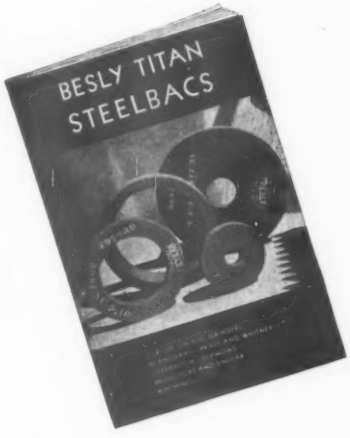
In the use of the lead pot for tempering, trouble is sometimes experienced by lead sticking to the work. This can be avoided by dipping the article in a solution of cyanide of potassium and water, about one pound of powdered cyanide to one gallon of boiling water. This should be used cold and the article permitted to dry before placing in the lead bath. Salt may be added to the lead bath to keep it clean, and a covering of charcoal about the size of a pea may be used to prevent lead from sticking to the work and keep the air from the top of the pot.

To check work for minute cracks after hardening, apply oil to the tool and wipe it off and chalk the surface. The oil appears at the cracks, soaking through the chalk.

BESLY TITAN STEELBAC ABRASIVE DISCS



The list of users of Besly Titan Steelbac Abrasive Discs reads like the roll call of the world's most progressive manufacturers. • Those who are truly wide awake realize the advantages of this Bolted-On Resinoid Bonded grinding member. • Safe—Economical—Free Cutting—Long Lived—Easy to Mount—Practically No Waste. In other words, the best thing of its kind ever developed. You don't have to accept our story without proof. Try these Wheels on your Blanchard, Pratt & Whitney, Diamond, Osterholm, Bridgeport or any face grinding machine. Originally developed for the Disc Grinder but are now also widely used on these other machines. They really have merit.



Write for your copy of Booklet on Besly Titan Steelbacs.

LET US SEND YOU FURTHER PARTICULARS

CHARLES H. BESLY AND COMPANY

118-124 NORTH CLINTON STREET ★ CHICAGO, ILLINOIS

New Literature

OF INTEREST TO THE TOOL ENGINEER

Most of the publications mentioned are furnished free. Requests should be made upon your firm letterhead, mentioning THE TOOL ENGINEER.

The Story of Superfinish. Arthur M. Swigert, Jr., Director of Production Research for the Chrysler Sales Division, Chrysler Corporation. Lynn Publishing Company, Detroit, Michigan. 684 pages. 720 illustrations. $2.50.

This book presents a complete picture of the problem of surface finish and the various methods of dealing with it which have been undertaken throughout recorded history, but with most of the emphasis naturally upon the development industrially of metal surface finishing during the last three decades.

Written in understandable language, and yet complete in technical detail, the book can hardly fail to interest the Tool Engineer whether he makes a casual reading of it or a close study in detail. There has probably never been a book previously published which compactly presented so much information of practical value in the production of fine metal finishes for wear-elimination and increased load-bearing capacity.

The principles underlying the Superfinishing process were first conceived by David A. Wallace early in 1934. Starting with this beginning *The Story of Superfinish* traces the research and development of this process and devotes several chapters to the most recent information

D. A. WALLACE

on this method of surface finishing. It also describes in detail twenty-four other methods of surface finishing and gives a thorough analysis of the methods of analyzing and measuring surface finish.

Planning the Industrial Apprentice Training Shop (14 pp) is the title of a pamphlet just issued by the South Bend Lathe Works, South Bend, Indiana. The urgent need for skilled machinists has created a demand for vocational training that necessitates an immediate increase in apprentice shop facilities.

This pamphlet contains a number of practical shop layouts, methods of organizing shop work, suggestions for selection of equipment, and lists of tools and accessories for various sizes of Apprentice Machine Shops. South Bend Lathe Works offers to design a shop floor plan suited to individual needs. Free upon request.

Specifications for the Cincinnati Centerless Lapping Machine (12 pp) is the new publication G-453, superseding G-418, of Cincinnati Grinders Inc., Cincinnati, Ohio. The folder includes a brief description of the machine, said to be capable of a finish of about two microinches, a discussion of centerless lapping, and the complete list of specifications. Request free copy on your firm letterhead.

Houghton Products for the Metal Working Industries is the title of a new booklet released by E. F. Houghton & Company, Philadelphia, Pa. It contains factual data on Cutting Oils, Carburizers, Heat Treating Salts, Inhibitors, etc., and constitutes helpful reference data to be retained in the file of metal working executives.

(Continued on next page)

NEW LITERATURE

(Continued from preceding page)

Landis Grinders for the Airplane Industry (36 pp) is the new and timely catalogue of the Landis Tool Company, Waynesboro, Pa. Profusely illustrated with pictures and sketches, the catalogue describes grinders for crankshafts, cams, valves, pistons, cylinders and cylinder liners, propeller shafts, and miscellaneous operations. Free upon request.

Pantograph Engraving Machines (20 pp) is the new catalogue of the George Gorton Machine Company, Racine, Wisconsin. Two 2-dimensional and two 3-dimensional pantograph machines are illustrated and described with complete specifications listed. Of interest to die and mold makers, the catalogue is available free upon request.

Backgrounds is the intriguing title of a splendid new periodic publication issued by Pratt and Whitney, West Hartford, Conn. In the initial issue (20 pp) are feature stories on varied applications of P & W products. Of particular interest is an article "Behind the 8-Ball of Age" by P & W President Clayton R. Burt and an editorial "Know America."

Precision Thread Grinding (12 pp) is the subject of a pamphlet recently made available by the Ex-Cell-O Corporation, Detroit, Michigan. The folder illustrates a number of precision thread grinders and contains descriptive material about them. Of interest to Tool Engineers are charts showing lead error in soft lead screws and in hardened and ground lead screws. Free on request.

The Forsberg Manufacturing Co., Bridgeport, Conn., has issued a new catalogue, No. 40 (64 pp) which features a complete line of their *Whale and Viking Tools.* A variation from standard catalogue practice places class numbers and prices along the outside edge of all pages. This should prove convenient for making quick references to the catalogue, which is free upon request.

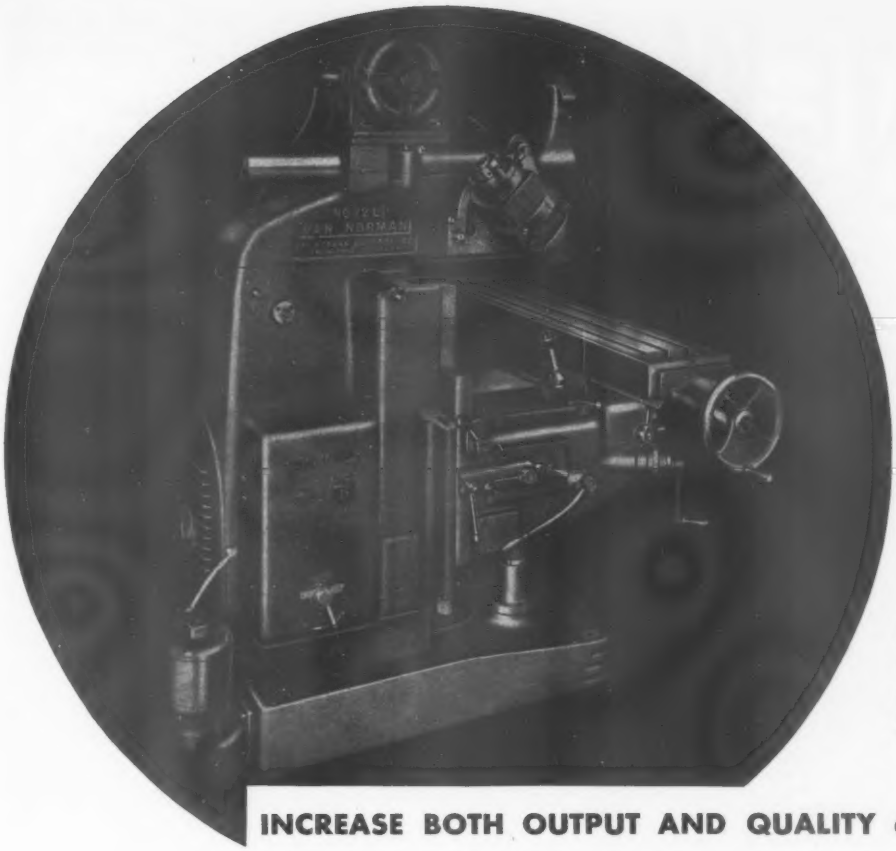
A Leaflet, describing the M-B "Utility" Pneumatic Grinder, Model U-T.R., and perforated to fit standard binder, is issued by M-B Products, Detroit, Mich. The leaflet contains data on a lightweight, high speed pneumatic grinder. The tool appears to have many unusual features and to be adaptable to a number of tool room uses. Free upon request.

Model "C" Lathes is the title of a new catalogue recently issued by Pratt and Whitney, Hartford, Conn. It illustrates and describes the 12", 14" and 16" precision lathes in the "C" line. Free upon request.

Bulletin SS-16 of the Chicago Metal Hose Corporation, Maywood, Ill., contains engineering data of special interest to industrial concerns. It describes Rex-Bellows, the "true bellows" 18-8 Stainless Steel Flexible Tubing. Both divided and fully corrugated forms are shown, together with couplings and the new pressure and vacuum tight joint secured by a process of electric resistance circumference seam welding which eliminates soldering and brazing. Free on request.

Logan Air And Hydraulic Operated Shell Holding Equipment (20 pp) has been released by Logansport Machine, Inc., Logansport, Ind. Although Logan has made holding devices for all sizes and types of shells or similar forgings for over twenty years, this is the first time the drawings and data have been assembled and made ready for general use. Free upon request.

Two new pamphlets describing Barnes Gear Pumps PA-20 Series, and the Barnes Piston Pumps PA-14, 16, 17, and 18 Series have been issued by the John S. Barnes Corporation, Rockford, Ill. These pamphlets are two of a series now in preparation, descriptive of Barnes hydraulic pumps, control valves, panels and units. Free on request.



No. 22-L

PLAIN & UNIVERSAL:
Table: 45" x 10".
Range: 26" longitudinal, 11" cross, 16" vertical.

INCREASE BOTH OUTPUT AND QUALITY on toolroom, contract, pattern, experimental and small-lot production work . . . with Van Norman Ram Type Universal Millers. The adjustments of swiveling cutterhead and sliding ram make it easy and convenient to mill vertical, horizontal, and angular surfaces...without attachments and with fewest reset-ups. There are many other important features: New streamlined column . . . directional front and rear controls of power feeds . . . 6-way rapid traverse for the new and improved table, knee and saddle . . . large dials . . . wide speed and feed selection . . . and greater rigidity. For a full picture of all the details provided in the new models of Van Norman Ram Type Universal Millers . . . write for illustrated bulletins.

VAN NORMAN MACHINE TOOL CO., SPRINGFIELD, MASS.

IT'S NEW

Hydraulic brakes for band saws . . . magnetic angle iron for magnetic chucks . . . automatic profiling . . . quick loading 2200 ton presses . . . the latest wrinkles from everywhere.

Several hydraulic presses (*see cut*) for forming metal aircraft parts have been built by the Farrel-Birmingham Company, Inc., Ansonia, Conn., which include as a special feature conveyor tables located on four sides of the press for loading and unloading to keep the presses operating at maximum capacity and increase output.

These tables are equipped with a movable platen on which dies are mounted and carried into and out of the press. The platens are controlled from a main control desk alongside the press control desk. The stroke of the conveyor cylinders is so designed that the platen registers uniformly on the press bolster. The construction of the conveyors is such that they can be readily removed in the event that large dies occupying the full length and width of the press are used.

These presses have a maximum tonnage capacity of 2200 tons and are among the largest used for metal forming in the aviation industry. Each press weighs upwards of 175 tons and stands nearly 26 feet high. While the maximum capacity of these presses is 2200 tons under a hydraulic pressure of 2500 pounds per square inch on one 38 inch ram and two 20 inch rams, the pump control is of such design that a wide range of hydraulic pressures may be obtained by a simple adjustment at the control panel.

An independent automatic cross feed arrangement attachment (*see cut*) has been announced by Brown & Sharpe Mfg. Co., Providence, R. I., for use on No. 5 Plain Grinding Machines. With this attachment, which gives to the machine all the advantages of power plunge-cutting with no change in its regular capacities or operating convenience, it is claimed, it is possible to perform automatic straight-in-feed grinding.

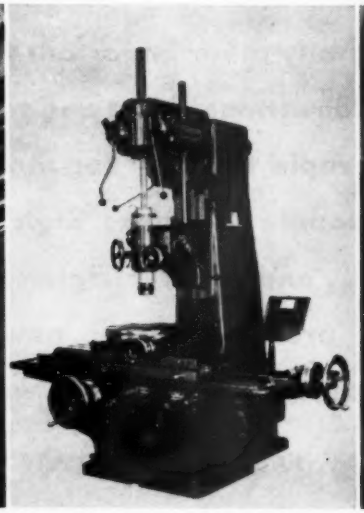
A separately controlled 1/20 H.P. motor mounted at the right front of the machine drives a variable radius crank mechanism which is mounted below the similar unit regularly a part of the machine. The Arrangement includes a vertical link which transmits motion to the cross feed pawl from either of the two crank mechanisms. Selection of feed for traversing or straight-in-feed grinding is made simply by connecting the link to the proper crank mechanism by means of a machine screw and hardened bushing fitting either of two holes in the link. Amount of feed per pick of the pawl is selected simultaneously by means of a pointer and a scale on the rotating member before the screw is tightened. The Arrangement must be applied at the factory before shipment.

Cleereman Jig Borers, manufactured by Cleereman Machine Tool Company and sold through its sales division Bryant Machinery and Engineering Company, Chicago, are now available with Power Rapid Traverse (*see cut*) to the table and carriage. This consists essentially of a built in motor which drives the screw through worm gearing, a small reversing drum switch used in conjunction with a magnetic reversing controller to control the motor and limit switches to prevent over-travel. Power rapid traverse is available for either the longitudinal travel only or for both the longitudinal and transverse travel.

A two jaw positive clutch is employed for engaging either the hand traverse handwheel or the power rapid traverse worm gear. Approximate settings are made with the power rapid traverse and the final precise adjustment of the table is then made by means of the fine feed handwheel.

(Continued on next page)

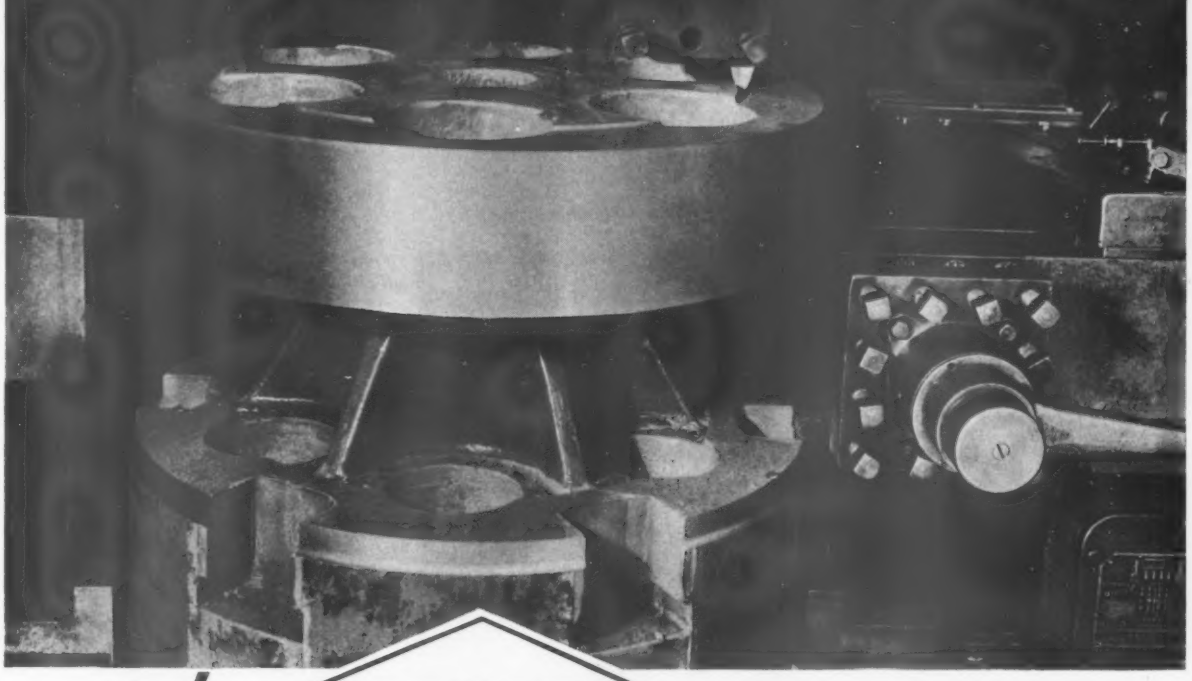
This Farrell 2200 ton press for forming metal aircraft parts has tables for quick loading and maximum capacity.



A power rapid traverse on this Cleereman Jig Borer makes the approximate setting.

An automatic cross feed attachment by Brown and Sharpe gives the advantages of power plunge cutting on No. 5 Grinders.

INTERRUPTED CUTS AT HIGHER SPEEDS!



with FIRTHITE SINTERED CARBIDE TOOLS

PROBLEM:—How to speed up production in turning and facing 28" Diameter Cored Meehanite Spindle Carriers, reduce tool costs and re-grinds, produce a better finish?

SOLUTION:—FIRTHITE Cutting Tools were substituted for High Speed Steel.

RESULT:—Firthite tool set-up produces 5 times as many pieces per grind as High Speed Steel at twice the feed and 3½ times the speed, resulting in nearly 7 times the stock removal in a given period! Additionally, FIRTHITE'S perfect balance of strength and hardness enables it to withstand the shocks of interrupted cuts and to resist the wear caused by this sorbitic cast iron.

MORAL:—Ask for a shop demonstration of FIRTHITE when stubborn production problems trouble *you*. It will cost you nothing—it may save you much!

FIRTH-STERLING STEEL COMPANY

OFFICE AND WORKS:
McKEESPORT, PA.
BRANCH WAREHOUSES:
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DAYTON
CLEVELAND DETROIT

IT'S NEW

(Continued from preceding page)

A new profiling machine has just been announced by National Broach & Machine Company, Detroit, Michigan. It is said to be very rapid, entirely automatic and holds finished work to a tolerance limit of .002". Nor is any mechanical skill needed to operate this machine. Because it is entirely automatic (stopping itself at the end of the cutting cycle), one operator can handle more than one machine. All he is required to do is load and unload the two work fixtures.

Profiling by the Red Ring method is restricted to the milling of profiles, internal or external, flat or undercut, on parts having a profile pattern not larger than 6" x 8" x 2" thick where the cut is 1/8" deep or less on a face 3/4" wide or less.

The Machine utilizes a closed differential hydraulic circuit to actuate its movement. This assures freedom from chatter, considerably greater responsiveness to directional changes of guide pin, and much closer limits of accuracy in the finished part.

The work table which carries two work fixtures (to double the rate of production) moves laterally. The spindle head which carries two spindles moves at a right angle to the direction of table movement. These two principal movements are both reversible, and each is actuated by its own hydraulic cylinder. A master pattern or cam the exact size and shape of the finished work part is mounted rigidly to the bottom of the work table. A guide pin integral with the spindle head extends upward under the table to contact the periphery of the master cam. The location of this mechanism beneath the table avoids errors caused by chips and dirt.

This Tannewitz high speed band saw has hydraulic brakes.

A No. 2 Heavy Duty Profile Grinder has been put on the market by the Boyar-Schultz Corporation, Chicago, which is practically universal in its design and application. The grinding spindle, running at about 10,000 RPM, is driven by a two HP motor and oscillates vertically about 100 times per minute, assuring even wear to wheels. It is equipped with a Multi-Purpose Head which carries an upper spindle making it possible to grind shapes from above, where desirable.

A danger in the operation of band saws has been the hazard resulting from blade breakage. The possibility of injury to the operator as well as damage to the machine itself is great during the interval before the whipping blade can be stopped. The Tannewitz Works, Grand Rapids, are equipping their high speed models (*see cut*) with hydraulic two-wheel brakes which operate automatically in case of saw breakage.

Similar in construction to automobile brakes and perfectly synchronized, these brakes automatically bring both wheels to a dead stop within an instant after saw blade breakage occurs, completely eliminating the hazard of a whipping broken blade, it is claimed. The brakes are also an advantage in stopping the machine instantly in ordinary operation without strain on the saw blade, resulting in a saving of both time and blades.

(Continued on following page)

NOW As Many Spindles As You Need

In ONE Low Cost Delta Unit

$983.50

8-Spindle 17" Drill Press Unit with No. 2 Morse Taper Spindles — complete with bench legs and table, but without motors.

With this new low-cost set-up, you can have just the number of spindles you need—one, two, three, six, eight—any number that meets your exact requirements. You can have any type of Delta 17" or 14" drill press heads—all 17"—all 14" or any combination of both—spaced at any distance you desire, either close together or far apart.

This new development gives you an efficient continuous drilling and tapping production line, eliminating costly transferring from one drill press to another—and at the same time provides maximum working surface. Best of all, the cost of this new kind of set-up is a fraction of what special set-ups of this type formerly cost. For instance the 8-spindle 17" drill press unit with No. 2 Morse Taper Spindles, here illustrated, complete with bench legs is only $983.50 without motors.

Built up of sectional tables, the table surface is 23⅜" by 125". Center to center between spindles is 15" maximum distance. Chuck to table 26". Quill has 5" stroke, drilling capacity is ¾" in cast iron. The table is accurately ground—and the entire unit is rugged, heavy and extremely accurate.

For full details on this new "Tailor-made" drill press development—write us today, telling how many drill press heads you could use on a set-up like this, whether you need 17" or 14" heads or a combination of both, and how far apart you want the heads placed. We will gladly send you complete specifications, prices and any other information you wish.

Delta MANUFACTURING CO.
Industrial Division
484 EAST VIENNA AVENUE
MILWAUKEE, WISCONSIN

DELTA MFG. CO.
686 E. Vienna Ave., Milwaukee, Wis.

Please send us, without any obligations, full information on your new drill press development. We are interested in..... drill presses on this set up, ...17", ...14", spaced..... inches apart.

Name.....

Address.....

City.....State.....

IT'S NEW

(Continued from preceding page)

A universal Magne-Blox Angle Iron for use with the magnetic chuck and designed for holding diversified work of all types is the latest development of the George Scherr Company, New York City.

When placed on the plane surface of the magnetic chuck, the Magne-Blox Angle Iron will actually form a magnetic rightangle which gives the same holding power per square inch as the chuck itself. It consists of a series of steps measuring in width 3/16", 3/8", 1/2", 1-5/16", and 1 5/8" upon which may be placed many types of special pieces for surface grinding without the use of complicated clamps and attachments.

An interesting time and cost saving development recently introduced at the Peerless Pattern Works, Detroit, involves automatic form cutting with a shaper (*see cut*) through the use of a form duplicating control. Faced with the problem of machining the sides of a quantity of magnesium crank case and barrel core boxes to provide for the application of steel wear plates which would normally require milling with frequent checking and a floor-to-floor time of roughly three hours per piece, a valuable short cut was introduced.

A simple, low cost die duplicator produced by Detroit Universal Duplicator Company was hooked up to a shaper, a template of the form provided, and machining time was reduced to about thirty minutes, (a saving of better than eighty percent).

Checks indicate that consistent accuracy within .002 inches is being maintained in the operation. The steel template conforming to the shape of the core box is mounted on the table of the machine, and a tracing finger, supported by a tracer head mounted with a bracket on the shaper follows the contour of the template, controlling vertical feed, while transverse feed is automatically governed by the setting of the shaper. The work itself is clamped in duplicate to the table parallel to the template so that several pieces can be machined at one time.

A form duplicating control made possible automatic form cutting with a shaper and resulted in a saving of nearly 80% with this Detroit Universal Duplicator.

Fast Production Needs Correctly Ground Tools!

GRIND THEM ON A SELLERS TOOL GRINDER!

More vital than ever before is the need for correctly ground tools and tool bits—for it is only when tools are properly shaped and have the right clearances and angles of inclination that they can take heavier cuts at higher speeds for fast production work.

Sellers Tool Grinders provide a simple and efficient means of accurately producing correct tool shapes and of ***duplicating these shapes on any number of tools.***

To keep in step with today's production demands, you need a Sellers Tool Grinder in your plant.

Write for the Sellers 4-T Tool Grinder Bulletin.

WILLIAM SELLERS & CO., Incorporated

1624 Hamilton Street **Philadelphia, Pa.**

Sellers

PRODUCTION PERSPECTIVES

News of Mass Manufacturing from Everywhere

BUSINESS conditions, after passing a low spot in April and rising sharply throughout the latter part of May and June, dropped off somewhat throughout July. Spending was reduced and much of the slump may have been due to failure of government war orders to materialize as rapidly as had been expected.

Industrial Production, which had reached a low in the spring, continued to increase. The machine tool industry continued to operate about as near theoretical capacity as it is likely to get in the near future. Principal deterrent continued to be fear of a peacetime slump that might wipe out any manufacturer who made careless additions to capital investment.

During July, in order to encourage capital investment, the Treasury Department agreed that capital outlays for Defense purposes may be depreciated at 20% a year. By reducing taxable profits this in effect amounts to a reduction in the excess-profits tax, may remove many manufacturers from the higher brackets altogether.

Plans were also made for repealing the Vinson-Trammell Act which limits profits of ship and airplane builders to profits of 7 and 8% on Government contracts.

Thus Washington seemed to be feeling the influence of the Defense Advisory Commission and it began to seem likely that the way would be cleared for increased production with as little "morning after" effects as possible.

THE Ford Motor Company is proceeding with plans for the construction of airplanes. A staff of about three hundred is at work with preliminary design and tooling. The Highland Park plant will be reopened and fuselages will be built there, it is reliably reported. The rest of the work will be done at the Rouge Plant in Dearborn. It was less than ten years ago that the Ford Company discontinued the production of airplanes and this time Henry Ford is said to have stated he was in the business for good.

As a matter of speculation, it is likely that spot-welding may be introduced in order to speed up production. From previous statements of Henry Ford it is believed that once the war is over he will go on the market with a low cost private plane produced by mass production methods.

The machine tool industry operated at 92.3 per cent of capacity in June, compared with 92.5 per cent in May, the National Machine Tool Builders' Association reported July 15. The June rate is the lowest since November last year when operations were reported at 91.2 per cent of capacity but was 27.5 per cent above the September rate of 74.6 per cent.

The Van Norman Machine Tool Company of Springfield will share in the latest spending by the U. S. government for its defense program. The department of labor awarded a war ordnance department order, valued at $13,668, for milling machines.

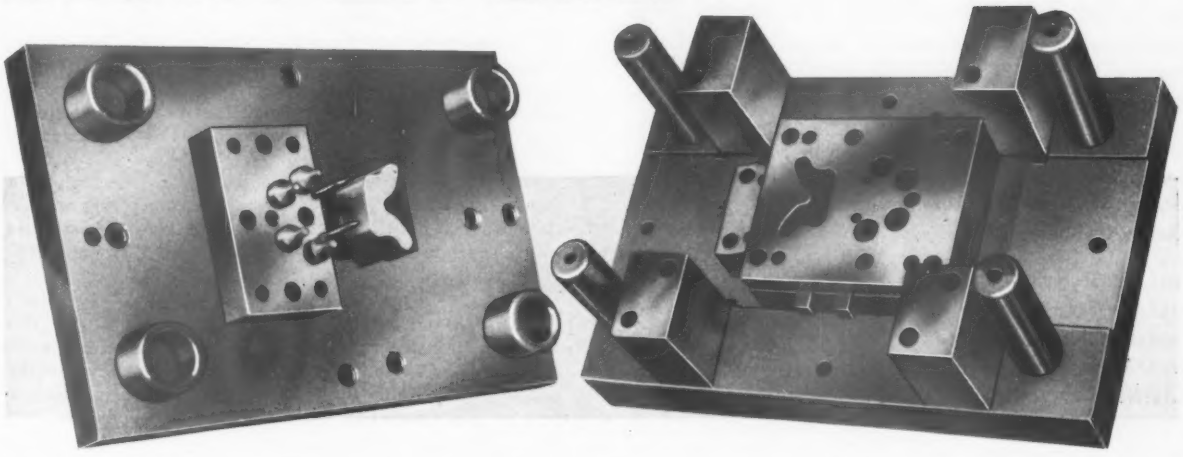
THE Jones & Lamson Machine Company, Springfield, Vermont, have begun work upon an extension which will increase their floor space by 21,000 sq. ft. Included in the extension is a new paint room which will contain no booths; instead a water wash down-draft exhaust system will be employed. This will make a total of 60,000 sq. ft. added to the plant within the past twelve months.

The George Gorton Machine Co., Racine, Wisconsin have just completed a new factory addition. The new structure houses the assembly and shipping departments and a new stock room.

The Holo-Krome Screw Corporation, Hartford, Conn. has begun erection of an addition to their Elmwood plant, the second within a year.

(Continued on following page)

The Choice Of The RIGHT *Die Steel*



INCREASED PRODUCTION 367½%

FROM 40,000 pieces to 147,000 pieces per grind . . . that was the production gain after Braeburn Equalized Superior No. 3 was used for these lamination dies. This is only one of the many instances where this steel has been responsible for proportionate increases in the life of dies and tools.

Superior Steels have the general properties of deep hardening which provides excellent resistance to wear or abrasion. They are practically non-deforming and free from distortion or cracking in hardening. Unlike most steels of this type, a special annealing treatment, known as "Equalization," makes them extremely easy to machine. For your own satisfaction, put Superior Special Die Steels to the tests of your own work. Then you will understand fully why they are so popular with die-makers and tool-makers everywhere.

BRAEBURN *Equalized* SUPERIOR No. 3 SPECIAL DIE STEEL

• • • •

For the work on which the lamination dies illustrated are used, the material is .75 to .85 carbon black tempered spring steel of .015" gage, Rockwelling from 45 to 50. The roll feed is 148 hits per minute.

Write for Complete Information, Including Recommended Applications

"THE TOOL STEEL MILL"

BRAEBURN ALLOY STEEL CORPORATION

Braeburn, Pennsylvania • Branches and Warehouses In Principal Cities

PRODUCTION PERSPECTIVES

(Continued from preceding page)

The Wage-Hour Division of the Department of Labor is about to crack down on industrial violations of the wage-hour law, Col. Philip Fleming, wage-hour administrator, stated recently while in Cleveland conferring with officials of the local office. A more rigid inspection of industry as a whole to guard against what he termed "competitive chiseling" is being launched by the Wage-Hour Division, Col. Fleming said. Making a tour of regional offices in the heavy industrial areas, he said that strict enforcement of the Wage-Hour Law is a benefit to legimitate industry, since it serves as a protection to non-violators against violators whose chiseling puts them in a position for unfair competition.

With 1,800 already in training, a total of more than 2,400 men will be undergoing special schooling in welding and machine shops in 15 Massachusetts municipalities as part of the state's share in the national defense program by the middle of the summer.

RAILROAD equipment purchase programs call for new orders for steel rails, freight cars and locomotives costing approximately $20,000,000. Heading the list is the authorization by Pennsylvania Railroad directors for the purchase of new modern equipment costing $10,000,000, including 2545 freight cars, 25 locomotive tenders and construction of two high-speed coal-burning steam passenger locomotives and eight ultra-modern type passenger cars, and The Norfolk & Western Railway which will proceed immediately with an improvement program costing approximately $8,000,000.

In case of a national emergency Standard Oil of New Jersey is prepared to make large quantities of synthetic rubber and high explosives. "We have developed butyl that is superior to natural rubber for many cases and could supply it in any required quantities," President W. S. Farish told stockholders. Standard of New Jersey also has collaborated with Firestone Tire & Rubber Co. in manufacturing Buna rubber, originally developed in Germany from coal and gas and which is being used in blitzkrieg weapons. Buna is impervious to oil damage and therefore will not compete with butyl which is not oil resisting. Butyl rubber is made from petroleum and "we are in position to manufacture it in any required quantities as rapidly as the necessary plant facilities can be installed," Farish continued. The New Jersey company is also in position to go into large-scale production of trinitritoluol (TNT) and nitroglycerine if requested by the government.

ELASTIC Stop Nut Corporation has moved its general offices from Elizabeth, New Jersey, to its new plant at Union, New Jersey, a suburb of Newark. The transfer of manufacturing equipment, which has been in progress for several weeks, has been completed.

Freight car loadings on the nation's railroads in the third quarter of this year are expected to be about 9 per cent higher than in the same period of last year, according to estimates compiled by the 13 shippers' advisory boards and made public at Washington, D. C. July 1.

Construction of a new addition, the second in six months has been completed for the Waterbury (Conn.) Tool Co. New machinery has been installed and production was started July 8. The addition increases employment more than a third.

To relieve crowding of machinery the L. S. Starrett Co. is preparing to construct a three-story addition 60 by 40 feet. The addition will be built over the single-story now housing the hacksaw hardening department bringing that section of factory to a four-story level corresponding to adjacent buildings. The move is made to improve working conditions in adjacent sections where machines were too close and does not mean an employment increase, according to David Findlay, president of the concern.

Handy Andy Says—

AT time of writing—July 15—the Machine has mastered the Continent, now, win, lose or draw, poises for attack on England. Leaving that issue to decide itself, it is becoming quite apparent that the fallen democracies (so called) of Europe have largely been victims of their own remissness, if not folly. In their reduction to vassalage, the vaunted "fifth column" seems to have been a lesser quantity after all; the deciding factors have been internal dissension, greed, treachery and political stupidity and chicanery. Czecho-Slovakia was sold out in a futile gesture of appeasement, Poland, with her ill disposed Corridor, was a source of provocation to her neighbors, Belgium was surrendered by pro-Nazi leaders, and France, the most highly militarized nation on earth, collapsed from internal rot.

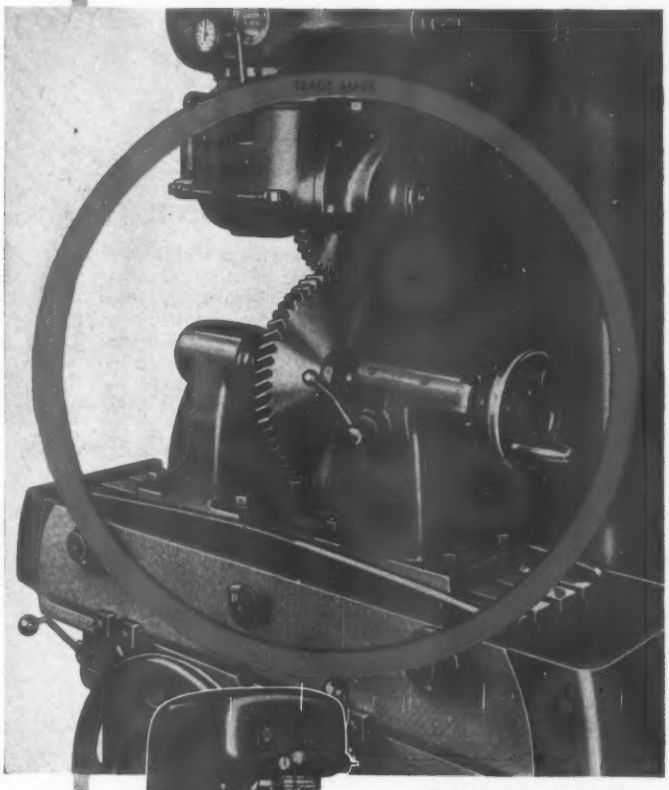
Denmark, unarmed, trusted to a "scrap of paper"—Otherwise a non-aggression pact—and the Dutch to their dikes, while Norway was a victim of various misfortunes, pride that "goeth before a fall", a leftist labor government, treason from within and treachery from without. Finland and Sweden, for the time enjoying a dubitable freedom, are in imminent danger of subjection by contending authoritarian powers. Perhaps a demonstrated willingness to fight, on the part of the one, and a masterly diplomacy backed by an efficient if small military machine, on the part of the other, may defer their political extinction. (Their economic ruin has already been effected.) The sun of the small nations is in eclipse, if it has not already set.

All of these smaller nations believed in liberty, even as we believe in it. But, their cardinal sin was comparative military poverty, as ours is military unpreparedness, a fault we are belatedly correcting. To be free, in an age of international lawlessness, a nation must be able to defend itself, and that takes staggering wealth, the unity of its citizens and the subordination of political differences to the welfare of the state. It was lack of unity, among the kindred Scandinavian peoples, that caused their respective states to fall separately; united, they could have been a force to reckon with. Now . . . "it might have been". Still, they had reason to trust a neighbor. For what Hitler has quite forgotten,—if he ever gave it a thought—in his fanatical zeal for his adopted Germany, is that when der Reich was prostrate after Versailles, and her

RED RING

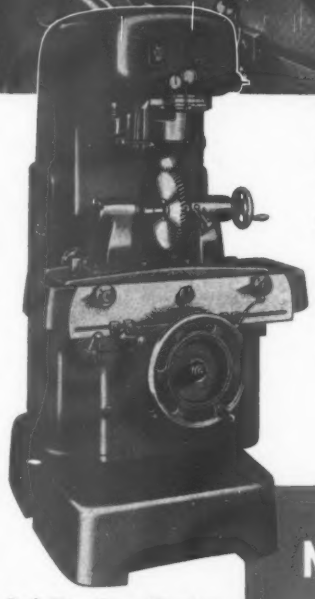
CROWNED TEETH *for* DIESEL TIMING GEARS

Eliminate Edge Bearing
Prolong Service Life



Red Ring Crowning Attachment—adds any desired crown to teeth at no extra expenditure of time or cost.

Crowned gear teeth.



Red Ring Gear Shaving Machine—speeds and improves gear finishing.

The new crowning attachment of the Red Ring Gear Shaving Machine, will crown gear teeth—i.e. give them a slight barrel shape—at no extra expenditure of time or cost.

Crowning has had wide acceptance in finishing Diesel timing gears because it eliminates edge contact, assures adequate bearing in spite of slight errors of alignment or deflection. All this prolongs service life—eliminates gear noise.

Write for data on the Red Ring Crowning Attachment, and Red Ring Gear Shaver.

Patents issued, others pending.

NATIONAL BROACH AND MACHINE CO.

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people starving, the Scandinavians and the Dutch opened their homes to her children, fed them and reared them, did for "the least of these". Now, the homes that once sheltered Hansel and Gretchen lie in ashes and ruin or in the shadow of encroaching doom.

Oh, it's an efficient *machine* the Nazis have created, and, whatever ones leanings, one cannot but admire the proficiency of its creators. Yet, I charge that Hitler's is a misdirected genius. I can sympathize with the grave economic problems of the short lived German republic, can understand the Messianic appeal of a Hitler at a time of economic nadir. I concede the provocation of the Polish Corridor, that France may have been in need of moral as political rebirth, and that the British lion may have needed a manicuring—a matter of viewpoint. But, these things could have been effected, in time, without plunging a world into misery.

Consider, for example, that Switzerland, an Alpine oasis in a desert of "have-nots", and accessible only through surrounding states, achieved economic competence, maintained no "weeping wall" because of lack of raw materials. The Swiss bought them, turned them into saleable goods. And that Sweden, poor in everything but ores and forests (which she conserved) achieved a national prosperity that raised her to the status of the economic giant of Europe. In standards of living, second only to the United States and the highest in Europe, in the evolution of a workable, "middle way" *social-democracy* and the enhancement of civilization, the Swedes set an example that Germany, infinitely richer in natural resources, could well have copied.

Oh well, all that is water over the dam, and the dam is broken. "Now, the deluge"! But, it's not Europe that I am concerned with so much as our own United States. For we in America have more to cherish and more to lose than any other people on earth, consequently, we have more to fight for. And we may have to fight, for we are in a state of war, if not by proclamation then by implication. We have been committed to a side, are aligned with a foreign power against foreign powers. Hence, we should expedite our Preparedness Program so that, if we become actively involved, we have mechanical if not numerical superiority; in these days of *blitzkrieg* it is not so much the bigger army that counts as the bigger and better Machine. The foregoing being axiomatic, it will be largely our own fault if, ignoring patent truths, we surrender our heritage of liberty.

Oh, our American system is full of holes, no denying that. But with all of its faults, it is still the best so far evolved by man. In a practical sense, that is. There are systems which, in theory, give promise of the elusive Utopia, but where these have leaned too far to the left or

the right, as the case may be, they have been found wanting. Between extremes, averages. It is significant, in this connection, that almost without exception the vanquished nations of Europe have had labor governments in which the 40 hour week, arbitrarily adhered to at a time of national emergency, was a factor in collapse. In direct contrast, the victors were not embarrassed by any debate over hours; the state came first and the devil take the hindmost. He did.

The best government that Europe has evolved, with all its centuries of advantage, still trails the United States by a wide margin. Our standards of living are by far the highest, and our extremes of poverty and wealth, made so much of by rabble rousers and demagogues, isn't so much a fault of system as a fault of people. Perhaps, after all, the war may be a blessing in disguise, it may jolt us into social, economic and political sanity. We have been to profligate with our heritage.

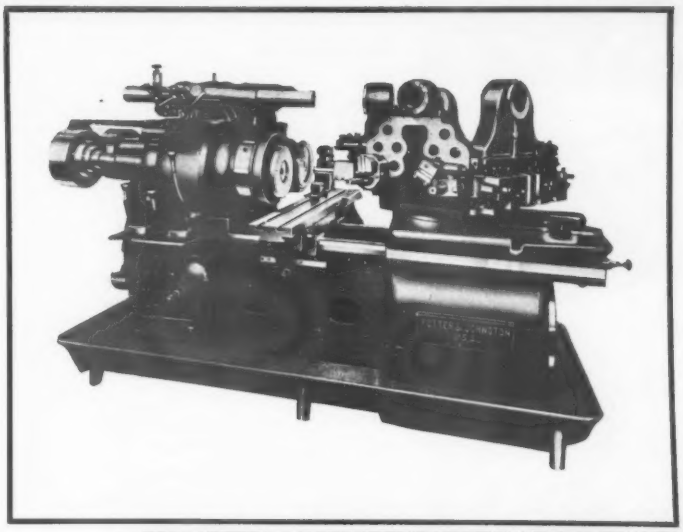
Slums do not make people so much as people make slums. I have seen a beautiful residential section, shaded by stately trees and graced by cool lawns, become dilapidated and sere inside of a generation as the "wrong people" encroached on the thrifty. Yet, the grass was there, needed but water and tending, and surely a tree in the yard is as good as the one in the remote park. The creator of the slum may yearn for the beauty and comfort of the thrifty neighbor's yard, but he won't work to have its like. Yet, in times of depression (and even in times of boom, as at present here in America) the thrifty are obliged to support the shiftless, nor may they, should they feel pinched themselves, have help as long as they own a vestige of title to their homes. That is one extreme of poverty and wealth that has been carefully overlooked by the reformers, an extreme that may be levelled once we take the country from the politicians and give it back to the people.

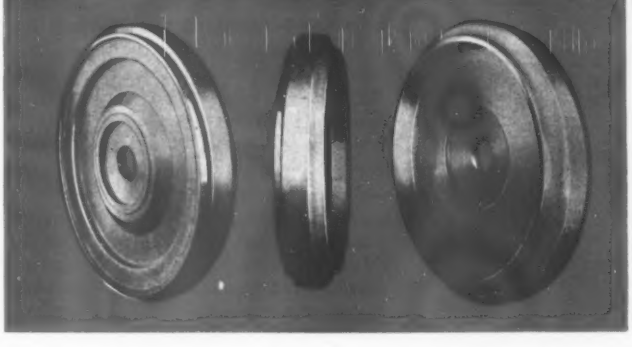
We have racketeering, and many municipal codes are written with direct intent to mulct the public and benefit the grafters. We permit it in the name of democracy, yet, this is a phase of political immorality that could be cancelled by the will of the people. Truly we have much to improve, but just as truly we have much to hold, and, we had best consider workable means for holding it. For, we may not like the *ehrsats* system the totalitarians would foist upon us. After all, theirs is the system engendered of desperation and low wages; ours is the system of the "haves'. And, it has worked so well that the American people get better homes, better food, shoes and clothing and more of luxuries for fewer hours of labor than falls to the lot of any people anywhere else in the world. The totalitarians have no *ehrsats* for that.

Yours for the American System,
Handy Andy.

A COMPLETE FLYWHEEL during each Machine Cycle on P&J 5D-2 Spindle Powerflex Automatic Chucking Machine

4.59 Minutes Machining Time





This 2-spindle Automatic Chucking Machine, designed and tooled by P & J, makes possible this excellent machining time for a prominent manufacturer. Some interesting facts concerning this work are as follows: A number of operations are performed on two flywheels simultaneously—the first holding on the rear spindle, the second on the front spindle—the equivalent of one completely finished flywheel per cycle of the machine. Extreme accuracy is obtained (tolerances within .0015″ maximum run-out), the result of the highly developed tooling and the extreme rigidity of the machine. This machine represents a low investment, due to the consolidation of two working spindles in one unit, which also conserves power and floor space.

For modern automotive production, for speed, accuracy and close economy, P. & J Automatics fill the bill with every application. New bulletins, on this machine and also on the complete P & J Line, with suitable production data, will be sent upon request—and without obligation.

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AGENTS IN FOREIGN COUNTRIES—Arthur Jackson Machine Tool Co., 60 Front Street, West, Toronto 2, Ontario, Canada; Arthur Jackson Machine Tool Co., 437 Grosvenor Ave., Montreal, Canada: Burton Griffiths & Co., Ltd., Birmingham, England; R. S. Stokvis et Fils, Paris, France: Rotterdam, Holland and Brussels, Belgium; Maskinaktiebolaget Kariebo, Stockholm, 1, Sweden; Ing. Ercole Vaghi, Milano, Italy; Yamatake & Co., Ltd., Tokyo, Japan (Imperial Export Co., 44 Whitehall Street, New York, N. Y.); Almaco, Zurich, Switzerland.

PASSING PARADE

Promoted

Irving S. Olds, 53-year-old New York lawyer, has been elected chairman of the board of the United States Steel Corp., succeeding Edward R. Stettinius, Jr., who resigned to devote his entire time to the National Defense Commission to which he was appointed by President Roosevelt.

Henry G. Goehring, for the past five years manager of the industrial relations department of Cuyahoga Works, American Steel & Wire Co., Cleveland, has been made industrial relations manager of National Refining Co., Cleveland.

J. E. Stanton, formerly associated with the Republic Steel Corp., on July 1 assumed his new duties as assistant to the president of Aviation Manufacturing Corp. at Williamsport, Pa. Mr. Stanton, who had been with Republic for 28 years, will coordinate the activities of industrial engineering and accounting of Aviation Manufacturing Corp.'s four divisions. A native of Cleveland, he went to work at 18 for Otis Steel Co. as a junior clerk.

J. L. Morrissey, formerly with the National Acme Co., Cleveland, where he was sales manager of the screw products division, after a period of more than 30 years, will join the Ferry Cap & Set Screw Co. July 10 as vice president, in charge of industrial sales. The Ferry company is also located in Cleveland.

W. H. Harrison, vice president and chief engineer of the American Telephone and Telegraph Co. has been appointed director of the construction division of the production department of the National Defense Advisory Commission. Harrison will serve under William S. Knudsen, chairman of the commission, who is co-ordinating industrial facilities.

J. Carlton Ward, Jr., formerly vice president and director of United Aircraft Corporation and general manager of the Pratt & Whitney Aircraft division, has been elected president of the Fairchild Engine & Airplane Corporation, Hartford, Conn. S. M. Fairchild president, was elected chairman of the board.

The promotion of several key men in the Holyoke works of the Worthington Pump and Machinery Corporation was announced as that plant prepared to expand to meet the requirements of the national defense program. J. Herbert Brautigan has been named assistant manager of the plant. He has been general superintendent. George Bolton has been promoted from production manager to shop superintendent. Frank J. Kelly is the new methods and tools supervisor and William H. Brooks has been appointed production superintendent.

(Continued on following page)

PASSING PARADE

(Continued from preceding page)

Carl J. Halborg was elected president of Colonial Broach Company, Detroit, to succeed the late Otto Lundell, at the annual meeting of the company's board of directors. Mr. Halborg who was previously Secretary of the company has been associated with Colonial since its organization in 1918.

Gold watches on July 6 were presented to 10 employes of the Warner & Swasey Co. who have 25-year service records with the concern. The veteran workers were honored at a get-together meeting of company employes, officials and wives and friends in the newly-completed addition to the company's plant at E. 55th Street and Carnegie Avenue S. E., Cleveland. Charles J. Stilwell, president of the company, unveiled a plaque listing the names of all employes with service records of 10 years and more. The meeting, which concluded with a luncheon served in a large tent, marked the completion of the plant addition and the 60th year of the company's history.

F. F. Hickey, formerly vice president of the Savage Arms Corporation, has been elected president to succeed W. L. Wright, who resigned from that position but has been elected chairman. Mr. Hickey will continue to make his headquarters at Utica, N. Y. and Mr. Wright at New York City. E. A. MacDonald of Utica, formerly secretary and treasurer, has been made vice president and treasurer. G. T. Wood of Utica, formerly assistant treasurer and assistant secretary has been named secretary. G. Noble Davidson of Chicopee Falls, formerly works manager, has been appointed general manager.

Died

Warren T. Lewis, crude rubber purchasing agent for the Firestone Tire & Rubber Co., died in Akron, June 25 after a month's illness. He was 51 years old. Mr. Lewis was born in Cleveland on April 4, 1889 and joined the Firestone organization in 1911. Surviving him are his widow, Rhea; his son, Warren T. Jr., his father and two brothers.

William A. Harshaw, chairman of the board of the Harshaw Chemical Co., died recently at his suburban Cleveland home after a six-weeks illness. He was 78. Mr. Harshaw was one of the oldest men actively engaged in manufacture of chemicals in the country. He was a respected figure in the ceramic, paint and varnish and electroplating industries as well as in the general chemical field. He was a trustee of Case School of Applied Science and had been active in the Cleveland Chamber of Commerce. Mr. Harshaw is survived by his wife, three daughters, and

(Continued on following page)

PASSING PARADE

(Continued from preceding page)

two sons, one of whom, William J., succeeds his father in the Harshaw presidency.

Fred A. Putnam, 79, president of the F. A. Putnam Manufacturing Company, Keene, N. H. and treasurer of the Markem Machine Company of Boston, died July 5 at the Elliot Community Hospital, Keene.

Louis E. Murphy, 66, formerly president and Chairman of the Board of E. F. Houghton & Co., oils, leathers and metal working products, Philadelphia, died on June 26 at his summer home at Mantalocking, N. J., following a short illness culminated by double pneumonia. He had been connected with the Houghton organization for 52 years, having started as an errand boy in 1888. He was elected secretary of the company in 1910, Vice-President in 1914, and President at the time of Charles E. Carpenter's death in 1929. He became Chairman of the Board, in 1934 when A. E. Carpenter was made president. After his resignation in 1936 he continued as a director up to the time of his death.

The Fansteel Metallurgical Corporation, North Chicago, Illinois, has announced two new folders, *Brazed Tip Tools For Cutting Steel* and *Oxy-Acetylene Welded Tip Tools For Cutting Steel*. The tools are made of "Tantung" an alloy containing tantalum and tungsten carbides, characterized by resistance to wear, impact, and heat. The folders are free.

•

An outstanding performance record was established by the Peerless 6" x 6" High Duty Hydraulic Metal Saw in use by a large manufacturer. The job in question was the cutting of sixteen bars of 1¾ inch diameter SAE 1010 steel at one setting of the hydraulic saw. The machine was set at 100 S.P.M. with a feed pressure of 160 pounds, using a six tooth high speed steel hack saw blade.

The first cut was completed in 6.5 minutes on the sixteen pieces and the cut was parallel within .005 inches. On the same work and using the same saw, the eighty-secondth cut was made in 6.65 minutes with the same accuracy on the finished work.

Analysis of the report reveals that, with a remarkably close degree of accuracy, the stock is being cut at the rate of approximately 3.7 square inches per minute—fast time considering the extreme accuracy being obtained. In all 1312 pieces were cut with the same blade, indicating that the saw removed approximately 1955 square inches of stock.

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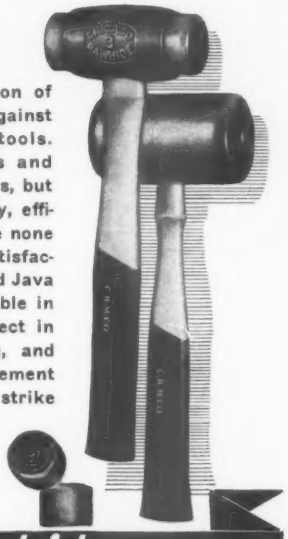
"SETTING-UP" DIE MAINTENANCE ASSEMBLY



Careful work — the protection of valuable equipment and dies against damage — requires good tools. Chicago Rawhide Hammers and Mallets are not only good tools, but from a standpoint of accuracy, efficiency, and economy there are none better — none that are as satisfactory. With faces of compressed Java Water Buffalo Hide (replaceable in the hammers), they are perfect in resiliency, hardness, balance, and accuracy . . . for every requirement where effective blows must strike "softly." Ask your supply house for a demonstration — now.

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They Cut Faster • Last Longer

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In actual production tests, it has been proved that speeds and feeds of Putnam End Mills can be increased approximately 30% over those of ordinary mills. In addition, breakdown tests have shown that they will give from 64% to 443% longer service. Putnam lists complete lines of all types of end mills from 1/16" to 2" diameters.

PUTNAM CONTINUOUS PILOT COUNTERBORES—
With these tools you get at least seven times longer life than could be expected of the old style counterbore. The pilot is continuous through the entire fluted portion. Cutters and pilots for body size holes are 1/32" over listed sizes—eliminating seating trouble.

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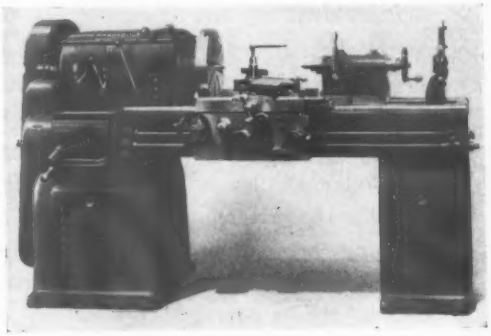

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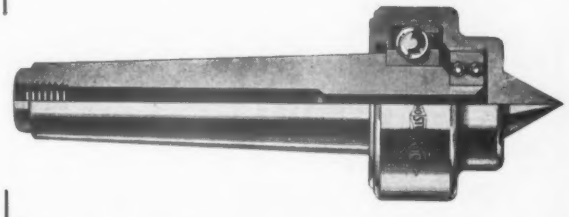

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MANUFACTURING COMPANY LOCATED IN PROVIDENCE, RHODE ISLAND is seeking the services of tool designers that are experienced and able to lay out jigs and fixtures.

COMPANY IN VICINITY OF PITTSBURGH, PENNSYLVANIA, requires services of Tool Engineer. Applicants must give full details of past experience and salary expected.

SITUATIONS WANTED

SERVICES AVAILABLE OF A MAN WITH THIRTY YEARS EXPERIENCE which includes work as Machinist, Draftsman, Machine Designer, Assistant Chief Engineer, Chief Engineer, Process Engineer. Available for interview in Philadelphia area.

APPLICANT IS SEEKING WORK AS—Chief Die Designer, Chief Tool & Die Designer, or Contact on Purchased Tools. Has ten years experience as Checker on dies and fixtures, and five years experience as Detailer on dies and fixtures. Last five years worked as Chief Tool Designer. Also available for interview in Philadelphia area.

MAN WITH TWENTY YEARS' EXPERIENCE in Production, Production Tooling, and Methods Development, is fully familiar with Plastics Moulding Technic. Has worked nine years as Foreman and Superintendent, and five years as Superintendent of Tool Division of large manufacturing company, is available for work as Factory Manager or Superintendent or Chief Tool Engineer. Applicant is also available for interview in Philadelphia area, and is interested in receiving word concerning vacancies in any part of the United States.

APPLICANT WITH FIVE YEARS MECHANICAL EXPERIENCE—Thirteen years experience as Chief Inspector,—and 3 years' work as Tool Engineer. Since 1927 to the present time this man's experience has been to Supervise Department, Design Tools, Jigs and Fixtures, to lay out plant production, to improve methods, to purchase tools and machines, and to teach apprentices and new help. Available for work as Superintendent or Assistant Superintendent, Tool Engineer, Inspection, Tools, Machine or Production. This man is available for interview in Minneapolis & St. Paul area, and is also interested in receiving word concerning vacancies in any part of the United States.

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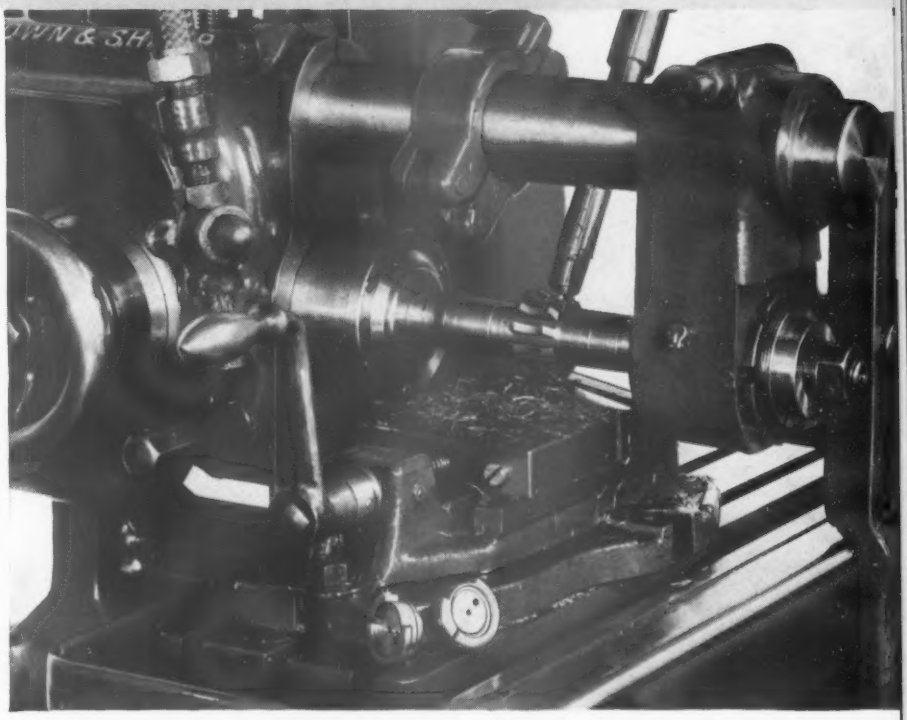

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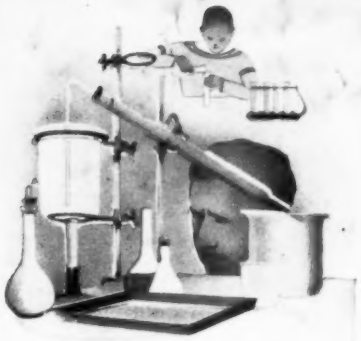

Development of New Products is imperative in any growing organization. Only machine tools of advanced design, such as LeBlond's can produce them economically.

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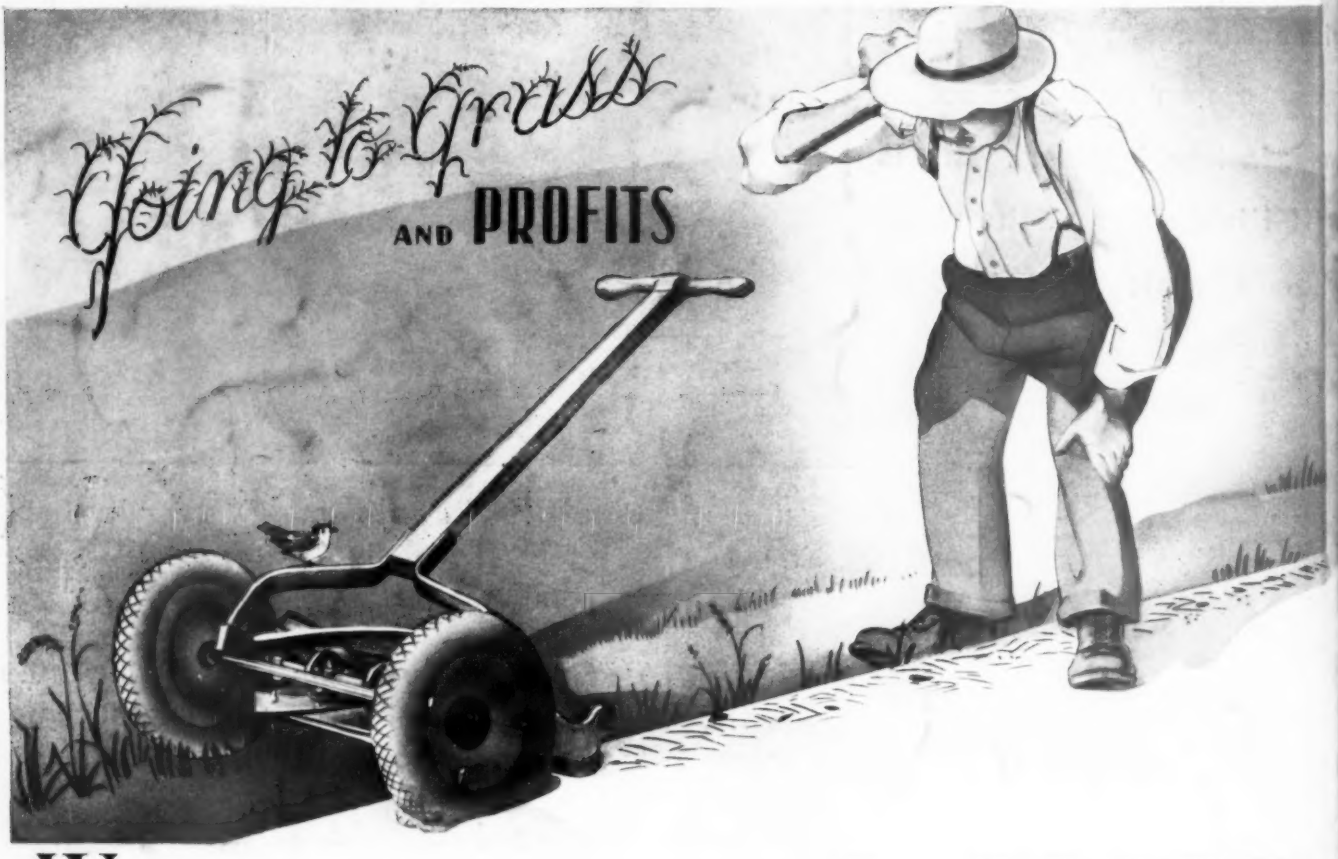

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